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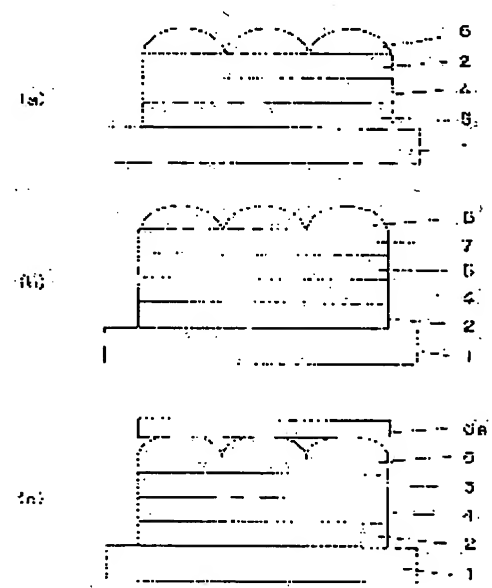
(54) ORGANIC ELECTROLUMINESCENT ELEMENT, IMAGE FORMING DEVICE USING IT, MOBILE TERMINAL, AND MANUFACTURING METHOD OF ORGANIC ELECTROLUMINESCENT ELEMENT

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an organic electroluminescent element maintaining a high-efficiency luminous performance with an excellent visibility, an image forming device maintaining a luminous performance with high efficiency, a light-weighted mobile terminal for use of long period, and a manufacturing method of the organic electroluminescent element with high workability and productivity to be formed in a simple process.
SOLUTION: The organic electroluminescent element, provided with at least a positive electrode 2 injecting holes, a luminous layer 4 having a luminous area, and a negative electrode 5 injecting electrons, on a substrate 1, is so structured that light irradiated from the luminous layer 4 is taken out from a light-taking-out face opposing the substrate 1 and a microlens group 6 consisting of almost hemispheric microlenses of at least two or more different sizes is formed on the light-taking-out face.



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CLAIMS

[Claim(s)]
[Claim 1]
The light which is the organic electroluminescent element equipped with the anode plate which pours in an electron hole at least, the luminous layer which has a luminescence field, and the cathode which pours in an electron, and is emitted from said luminous layer on a substrate is the organic electroluminescent element characterized by it being taken out from a substrate and the optical ejection side which counters, and coming to form the microlens group which consists of a microlens of the shape of an abbreviation semi-sphere from which at least two or more magnitude differs on said optical ejection side.
[Claim 2]
The anode plate which pours in an electron hole at least on a substrate, and the luminous layer which has a luminescence field, It is the organic electroluminescent element equipped with the cathode which pours in an electron. The microlens group which consists of a microlens of the shape of an abbreviation semi-sphere from which the light emitted from said luminous layer is taken out from a substrate and the optical ejection side which counters, and at least two or more magnitude differs on said optical ejection side, The organic electroluminescent element characterized by coming to form the microlens group which comes to form the flattening side where the front face becomes flat through an air space and some contacts at the optical ejection side side of the microlens group.
[Claim 3]
Said microlens group is an organic electroluminescent element according to claim 1 or 2 characterized by coming to stick on an optical ejection side through optical binding material.
[Claim 4]
said microlens group -- a refractive index 1.4 -- high -- claim 1 characterized by being formed with the refractive index ingredient thru/or an organic electroluminescent element given in the inside 1 [any] of 3.
[Claim 5]
Said microlens group is claim 1 characterized by being formed with the transparent ingredient which can emit 50% or more of the light emitted from a luminous layer thru/or an organic electroluminescent element given in the inside 1 [any] of 4.
[Claim 6]
Said microlens group is claim 1 characterized by being formed by carrying out optical association of at least two or more ingredients thru/or an organic electroluminescent element given in the inside 1 [any] of 4.
[Claim 7]
Said microlens group is claim 1 characterized by being formed on the protective coat formed in said organic electroluminescent element front face thru/or an organic electroluminescent element given in the inside 1 [any] of 6.
[Claim 8]
said protective coat -- a refractive index 1.4 -- high -- the organic electroluminescent element according to claim 7 characterized by being formed with the refractive index ingredient.
[Claim 9]
Said protective coat is an organic electroluminescent element according to claim 7 or 8 characterized by being formed with the transparent ingredient which can emit 50% or more of the light emitted from a luminous layer.
[Claim 10]
said optical binding material -- a refractive index 1.4 -- high -- claim 3 characterized by being formed with the refractive index ingredient thru/or an organic electroluminescent element given in the inside 1 [any] of

9.
[Claim 11]
Said optical binding material is claim 3 characterized by being formed with the transparent ingredient which can emit 50% or more of the light emitted from a luminous layer thru/or an organic electroluminescent element given in the inside 1 [any] of 10.
[Claim 12]
Said optical binding material is claim 3 characterized by being formed with the liquid or the gel ingredient thru/or an organic electroluminescent element given in the inside 1 [any] of 11.
[Claim 13]
Said optical binding material is claim 3 characterized by being formed with the ingredient hardened by heat or light thru/or an organic electroluminescent element given in the inside 1 [any] of 12.
[Claim 14]
Image formation equipment characterized by having the image display array which said anode plate and said cathode of claim 1 thru/or an organic electroluminescent element given in the inside 1 [any] of 13 are separated and constituted by the individual electrical-and-electric-equipment target in the shape of a stripe, and become from two or more pixels.
[Claim 15]
It is image formation equipment which said anode plate or said cathode of claim 1 thru/or an organic electroluminescent element given in the inside 1 [any] of 13 is separated and constituted by the individual electrical-and-electric-equipment target for every pixel, and said separated electrode is scanned through at least one or more switching elements, and is characterized by having an image display array.
[Claim 16]
The diameter of the microlens which is the organic electroluminescent element equipped with the anode plate which pours in an electron hole at least, the luminous layer which has a luminescence field, and the cathode which pours in an electron, and forms said microlens group on a substrate is image formation equipment according to claim 14 or 15 characterized by being smaller than the long side of said pixel.
[Claim 17]
The diameter of the microlens which is the organic electroluminescent element equipped with the anode plate which pours in an electron hole at least, the luminous layer which has a luminescence field, and the cathode which pours in an electron, and forms said microlens group on a substrate is claim 14 characterized by being smaller than the shorter side of said pixel thru/or image formation equipment given in the inside 1 [any] of 16.
[Claim 18]
They are claim 14 characterized by being the organic electroluminescent element equipped with the anode plate which pours in an electron hole at least on a substrate, the luminous layer which has a luminescence field, and the cathode which pours in an electron, and the distance from said luminous layer to the outermost surface of said microlens group being smaller than the long side of said pixel thru/or image formation equipment given in the inside 1 [any] of 17.
[Claim 19]
They are claim 14 characterized by being the organic electroluminescent element equipped with the anode plate which pours in an electron hole at least on a substrate, the luminous layer which has a luminescence field, and the cathode which pours in an electron, and the distance from said luminous layer to the outermost surface of said microlens group being smaller than the shorter side of said pixel thru/or image formation equipment given in the inside 1 [any] of 18.
[Claim 20]
A sound signal conversion means to change voice into a sound signal, and an actuation means to input the telephone number etc., A display means to display an arrival-of-the-mail display, the telephone number, etc., and the means of communications which changes a sound signal into a sending signal, A receiving means to change an input signal into a sound signal, and the antenna which transmit and receive said sending signal and said input signal, The personal digital assistant which is a personal digital assistant equipped with the control means which controls each part, and is characterized by said display means consisting of image formation equipment of a publication in claim 14 thru/or the inside 1 [any] of 19.
[Claim 21]
The manufacture approach of the organic electroluminescent element characterized by turning an optical ejection side in the equipment made into the vacua at ******, spraying heat curing or photo-curing transparence resin in the shape of a fog from down, and forming said microlens group by the thing [carrying

out postcure] after forming the anode plate which pours in an electron hole at least, the luminous layer which has a luminescence field, and the cathode which pours in an electron.

[Claim 22]

By allotting and vibrating the spherical transparence bead of the amount of extent which covers all front faces to an optical ejection side, after forming the anode plate which pours in an electron hole at least, the luminous layer which has a luminescence field, and the cathode which pours in an electron The manufacture approach of the organic electroluminescent element characterized by being characterized by arranging a transparence bead in the dense condition on an optical ejection side, slushing viscous low transparence resin, and forming said microlens group by the thing [carrying out postcure].

[Claim 23]

The manufacture approach of the organic electroluminescent element characterized by to arrange spreading or the spherical transparence bead of the amount of extent which sticks and covers all front faces for the viscous high transparence resin thinner than a transparence bead to an optical ejection side , to apply the force to homogeneity , and to form said microlens group for an excessive bead by Lycium chinense after forming the anode plate which pours in an electron hole at least , the luminous layer which has a luminescence field , and the cathode which pours in an electron .

[Claim 24]

The manufacture approach of the organic electroluminescent element characterized by forming [the sheet-like microlens group in which the semi-sphere-like microlens was formed] said microlens group for transparence resin by spreading or sticking and applying the force to homogeneity after forming the anode plate which pours in an electron hole at least, the luminous layer which has a luminescence field, and the cathode which pours in an electron.

[Claim 25]

The organic electroluminescent element characterized by being the organic electroluminescent element which equipped inter-electrode [two] with the luminous layer which has a luminescence field, having equipped one [said] electrode side with the substrate, and having the microlens group which consisted of abbreviation semi-sphere-like microlenses at the electrode side of said another side.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]
This invention relates to the organic electroluminescent element used for the light emitting device used for the light source of various image formation equipments or image formation equipment, a back light, or an optical-communication device, the image formation equipment using it, a personal digital assistant, and the manufacture approach of an organic electroluminescent element.
[0002]
[Description of the Prior Art]
An electroluminescent element is a luminescence device using the electroluminescence of the solid-state fluorescence matter, inorganic electroluminescence using the current inorganic system ingredient as an illuminant is put in practical use, and application expansion to a back light, a flat display, etc. of a liquid crystal display is achieved partly. However, the electrical potential difference required in order to make light emit of inorganic electroluminescence is as high as more than 100V, and since blue luminescence is moreover difficult, full-color-izing by the three primary colors of RGB is difficult for it. Moreover, since inorganic electroluminescence has the very large refractive index of the ingredient used as an emitter, it is strongly influenced of the total reflection in an interface etc., the ejection effectiveness of the light to the inside of the air over actual luminescence is as low as about 10 - 20%, and efficient-izing is difficult for it.
[0003]
On the other hand, although the research on the electroluminescence using an organic material also attracted attention for many years and various examination had been performed, luminous efficiency did not progress to full-fledged utilization research from a very bad thing.
[0004]
However, the organic electroluminescent element which will have the laminated structure of the functional discrete type which divided the organic material into two-layer [of an electron hole transportation layer and a luminous layer] by C.W.Tang and others of KODAKKU in 1987 was proposed, and it became clear that two or more 1000 cd/m high luminescence brightness is obtained in spite of the low battery not more than 10V [refer to C.W.Tang and S.A.Vanslyke:Appl.Phys.Lett and 51 (1987) 913 grade]. **** attention of the organic electroluminescent element begins to be carried out after this, research on the organic electroluminescent element which has the laminated structure of the same functional discrete type still now is done briskly, in order to be especially utilization of an organic electroluminescent element, examination is enough made also about indispensable efficient-izing and reinforcement, and the display using an organic electroluminescent element etc. is manufactured in recent years.
[0005]
Here, the configuration of the conventional general organic electroluminescent element is explained using drawing 8 .
[0006]
Drawing 8 is the important section sectional view of the conventional organic electroluminescent element.
[0007]
In drawing 8 , the substrate with which 1 consisted of glass etc., the anode plate where 2 was formed on the substrate 1, the electron hole transportation layer by which 3 was formed on the anode plate 2, the luminous layer by which 4 was formed on the electron hole transportation layer 3, and 5 are the cathode formed on the luminous layer 4.
[0008]

As shown in drawing 8 , an organic electroluminescent element The anode plate 2 which consists of transparent conductive film, such as ITO formed by the sputtering method, resistance heating vacuum deposition, etc. on the substrates 1, such as glass, N and N' which were formed by resistance heating vacuum deposition etc. the same on an anode plate 2 - diphenyl-N and N' -- the - screw (3-methylphenyl) -1 and 1' - diphenyl -4 and 4' -- with the electron hole transportation layer 3 which consists of - diamine (henceforth TPD) etc. The luminous layer 4 which consists of 8-Hydroxyquinoline Aluminum (henceforth Alq3) formed by resistance heating vacuum deposition etc. on the electron hole transportation layer 3, It has the cathode 5 which consists of a metal membrane of the 100-300nm thickness formed by resistance heating vacuum deposition etc. on the luminous layer 4.

[0009]

When direct current voltage or a direct current is impressed by making cathode 5 into a minus pole, using as a plus pole the anode plate 2 of the organic electroluminescent element which has the above-mentioned configuration, an electron hole is poured into a luminous layer 4 through the electron hole transportation layer 3 from an anode plate 2, and an electron is poured into a luminous layer 4 from cathode 5. In a luminous layer 4, the recombination of an electron hole and an electron arises, and in case the exciton generated in connection with this shifts to a ground state from an excitation state, luminescence happens.

[0010]

In such an organic electroluminescent element, outgoing radiation of the light emitted from the fluorescent substance in a luminous layer 4 is carried out to the omnidirection centering on a fluorescent substance, with the direction of optical ejection, it is once reflected toward hard flow in cathode 5 via the electron hole transportation layer 3, an anode plate 2, and a substrate 1, and it is usually emitted into air via a luminous layer 4, the electron hole transportation layer 3, an anode plate 2, and a substrate 1. However, since total reflection of the light which carries out incidence at the include angle from which the outgoing radiation angle of a refracted wave is set to 90, i.e., a bigger include angle than a critical angle, is carried out when the refractive index of the medium by the side of incidence is larger than the refractive index by the side of outgoing radiation in case light passes through the interface of each medium, an interface cannot be penetrated and it is not taken out into air.

[0011]

Here, the relation of the optical refraction angle in the interface of a different medium and the refractive index of a medium follows a Snell's law. According to the Snell's law, when light advances from the medium of a refractive index n1 to the medium of refractive-index n<SUB>2, the relation it is unrelated n1sintheta1=n2sintheta2 between the incident angle theta 1 and angle of refraction theta 2 is realized. Therefore, when n1>n2 are realized, incident angle theta1=sin-1 (n2/n1) used as theta2=90 degree is well known as a critical angle, and when an incident angle is bigger than this, total reflection of the light will be carried out in the interface between media.

[0012]

Therefore, in the organic electroluminescent element by which a light emission is carried out isotropic, the light emitted at a bigger include angle than this critical angle repeats the total reflection in an interface, is confined in the interior of a component, and is no longer emitted into air.

[0013]

Drawing 9 is the mimetic diagram showing the typical beam-of-light path in the important section cross section of the conventional organic electroluminescence element.

[0014]

In drawing 9 , like drawing 8 , for a substrate and 2, as for an electron hole transportation layer and 4, an anode plate and 3 are [1 / a luminous layer and 5] cathode, and 9 is the light source. As shown in drawing 9 , the light emitted from the light source 9 of the light emitted out of the luminous layer 4 sets to each interface, such as an interface (ITO / glass interface) of an anode plate 2 and a substrate 1, and an interface (glass / air interface) of a substrate 1 and air. At an include angle with the bigger outgoing radiation angle of a refracted wave than a critical angle, when the refractive index of light of the medium by the side of incidence is larger than the refractive index by the side of outgoing radiation, since total reflection is carried out, that at the time of incidence cannot penetrate an interface, and is not taken out into air.

[0015]

The light emitted in a luminous layer is not emitted to the component exterior, but this causes degradation on appearance as an organic electroluminescent element. Generally, as for the synchrotron orbital radiation obtained by the luminous layer of an organic electroluminescent element, most is confined in the interior of a component by total reflection, and it is known that being used as effective synchrotron orbital radiation is

17% to about 20% [refer to Advanced Material6 (1994) 491 grade].
[0016]
Then, aiming at solution of the trouble mentioned above by establishing a means to change the outgoing radiation include angle of light into the substrate of an organic electroluminescent element is proposed.
[0017]
As a conventional organic electroluminescent element, "the organic thin film electroluminescent element used for the light sources, such as a segment and a dot display," is indicated by JP,2773720,B, and the organic thin film electroluminescent element which raises optical ejection effectiveness by forming lens structure in the optical ejection side of a substrate is indicated.
[0018]
Moreover, "the organic electroluminescent element excellent in luminous efficiency" is indicated by JP,2991183,B, and the organic electroluminescent element which raised optical ejection effectiveness by forming a diffraction grating etc. in the location which controls the total reflection of a component interface is indicated.
[0019]
Moreover, "an organic electroluminescent element" is indicated by JP,9-129375,A and the organic electroluminescent element which raised optical ejection effectiveness by making a scattered reflection side, or reflection and angle of refraction produce turbulence for an optical ejection side front face is indicated.
[0020]
Moreover, "the display unit using an organic electroluminescent element etc." is indicated by JP,10-189251,A, and forming a means to change whenever [light emission elevation], in a transparence substrate is indicated.
[0021]
Moreover, "the organic electroluminescent element luminescence equipment used suitable for the display device of a noncommercial use and industrial use and a color display" is indicated by JP,10-308286,A, and the organic electroluminescent element which raises optical ejection effectiveness is indicated by forming a light reflex layer in a lower electrode side face.
[0022]
[Problem(s) to be Solved by the Invention]
However, in the above-mentioned conventional organic electroluminescent element, it had the following technical problems.
[0023]
(1) When having used for image formation equipments, such as a display, and lens structure and a pixel corresponded by 1 to 1, alignment of the lens had the technical problem that it was difficult and the fall of the visibility by location gap arose.
[0024]
(2) Since lens structure was in the optical ejection side side of a substrate side when using for image formation equipments, such as a display, making small distance of lens structure and a light-emitting part had the technical problem were difficult.
[0025]
(3) When lens structure was formed on a substrate, since luminescence from an organic electroluminescent element would penetrate both lens structure and a substrate at least and would be taken out into air, it will lose the part and light which go via a substrate, and had the technical problem that luminous efficiency worsened.
[0026]
(4) When the organic electroluminescent element which formed lens structure on the substrate as image formation equipments, such as a display, is used, Since the light emitted from the pixel of arbitration penetrates both lens structure and a substrate at least and is taken out into air, The light which carries out total reflection caused [which reaches another pixel via a substrate and is emitted into air from the pixel] the so-called stray light, and had the technical problem that faults, such as a fall of contrast, were brought about.
[0027]
(5) When an improvement measure in optical ejection effectiveness like mesa structure was given, area of a light-emitting part needed to be made small, and the design which considered the balance of a life and effectiveness is required, and it had the technical problem were disadvantageous for reinforcement.
[0028]

(6) When an improvement measure in optical ejection effectiveness like lens structure or mesa structure formed in the substrate side was given, it had the technical problem that it was difficult to design the orientation of light freely, and it caused a visibility fall, such as a wide-field-of-view angle property which is the description of an organic electroluminescent element.

[0029]

Offer of the image formation equipment which can maintain the efficient luminescence engine performance which this invention solves the above-mentioned conventional technical problem, and was excellent in offer of the organic electroluminescent element which can maintain the efficient luminescence engine performance excellent in visibility, and visibility, and weight are light, and it can form at the long personal digital assistant of a time, and an easy process, and it is workable and productivity is also aimed at offering the manufacture approach of an organic high electroluminescent element.

[0030]

[Means for Solving the Problem]

In order to solve the above-mentioned technical problem, the organic electroluminescent element of this invention The anode plate which pours in an electron hole at least on a substrate, and the luminous layer which has a luminescence field, It is the organic electroluminescent element equipped with the cathode which pours in an electron. The light emitted from a luminous layer is taken out from a substrate and the optical ejection side which counters, and consists of a configuration that the microlens group which consists of a microlens of the shape of an abbreviation semi-sphere from which at least two or more magnitude differs is formed on an optical ejection side.

[0031]

By this configuration, the organic electroluminescent element which can maintain the long lasting and high luminescence engine performance can be offered.

[0032]

Moreover, the anode plate where the image formation equipment of this invention pours in an electron hole at least on a substrate, It is the organic electroluminescent element equipped with the luminous layer which has a luminescence field, and the cathode which pours in an electron. The light emitted from a luminous layer is taken out from a substrate and the optical ejection side which counters. The anode plate and cathode of an organic electroluminescent element which are having the microlens group which consists of a microlens of the shape of an abbreviation semi-sphere from which at least two or more magnitude differs formed on an optical ejection side It separates into an individual electrical-and-electric-equipment target in the shape of a stripe, and consists of a configuration of having the image display array which consists of one or more pixels.

[0033]

By this configuration, the image formation equipment using the organic electroluminescent element which can maintain the long lasting and high luminescence engine performance can be offered.

[0034]

Moreover, the anode plate where the image formation equipment of this invention pours in an electron hole at least on a substrate, It is the organic electroluminescent element equipped with the luminous layer which has a luminescence field, and the cathode which pours in an electron. The light emitted from a luminous layer is taken out from a substrate and the optical ejection side which counters. The anode plate or cathode of an organic electroluminescent element which is having the microlens group which consists of a microlens of the shape of an abbreviation semi-sphere from which at least two or more magnitude differs formed on an optical ejection side It is dissociated and constituted by the individual electrical-and-electric-equipment target for every pixel, and said separated electrode is scanned through at least one or more switching elements, and consists of a configuration of having an image display array.

[0035]

By this configuration, the image formation equipment using the organic electroluminescent element which can maintain the long lasting and high luminescence engine performance can be offered.

[0036]

Moreover, the sound signal transducer from which the personal digital assistant of this invention changes voice into a sound signal, The control unit which inputs the telephone number etc., and the display which displays an arrival-of-the-mail display, the telephone number, etc., With the transmitting section which changes a sound signal into a sending signal, and the receive section which changes an input signal into a sound signal The anode plate where it is the personal digital assistant equipped with the antenna which transmits and receives a sending signal and an input signal, and the control section which controls each part,

and a display means pours in an electron hole at least on a substrate, It is the organic electroluminescent element equipped with the luminous layer which has a luminescence field, and the cathode which pours in an electron. The light emitted from a luminous layer is taken out from a substrate and the optical ejection side which counters. The anode plate and cathode of an organic electroluminescent element which are having the microlens group which consists of a microlens of the shape of an abbreviation semi-sphere from which at least two or more magnitude differs formed on an optical ejection side Separate into an individual electrical-and-electric-equipment target in the shape of a stripe, and have the image display array which consists of one or more pixels. Or the anode plate which pours in an electron hole at least on a substrate and the luminous layer which has a luminescence field, It is the organic electroluminescent element equipped with the cathode which pours in an electron. The light emitted from a luminous layer is taken out from a substrate and the optical ejection side which counters. The anode plate or cathode of an organic electroluminescent element which is having the microlens group which consists of a microlens of the shape of an abbreviation semi-sphere from which at least two or more magnitude differs formed on an optical ejection side It is dissociated and constituted by the individual electrical-and-electric-equipment target for every pixel, and an anode plate or cathode is scanned through at least one or more switching elements, and consists of a configuration equipped with image formation equipment of having an image display array.

[0037]
By this configuration, weight is light and a time can offer a long personal digital assistant.

[0038]
Moreover, after it forms the anode plate which pours in an electron hole at least, the luminous layer which has a luminescence field, and the cathode which pours in an electron, the manufacture approach of the organic electroluminescent element of this invention turns an optical ejection side caudad in the equipment made into the vacua, sprays heat curing or photo-curing transparence resin in the shape of a fog from down, is the thing [carrying out postcure], and consists of a configuration which forms a microlens group.

[0039]
By this configuration, it can form at an easy process, and it is workable and the manufacture approach of an organic electroluminescent element also with high productivity can be offered.

[0040]
Moreover, the manufacture approach of the organic electroluminescent element of this invention By allotting and vibrating the spherical transparence bead of the amount of extent which covers all front faces to an optical ejection side, after forming the anode plate which pours in an electron hole at least, the luminous layer which has a luminescence field, and the cathode which pours in an electron A transparence bead is arranged in the dense condition on an optical ejection side, viscous low transparence resin is slushed, and it consists of a configuration which forms said microlens group by the thing [carrying out postcure].

[0041]
By this configuration, it can form at an easy process, and it is workable and the manufacture approach of an organic electroluminescent element also with high productivity can be offered.

[0042]
Moreover, the manufacture approach of the organic electroluminescent element of this invention After forming the anode plate which pours in an electron hole at least, the luminous layer which has a luminescence field, and the cathode which pours in an electron, viscous high transparence resin thinner than a transparence bead is applied to an optical ejection side. Or it sticks, the spherical transparence bead of the amount of extent which covers all front faces is arranged, the force is applied to homogeneity, and an excessive bead is consisted of a configuration which forms said microlens group by Lycium chinense.

[0043]
By this configuration, it can form at an easy process, and it is workable and the manufacture approach of an organic electroluminescent element also with high productivity can be offered.

[0044]
Moreover, after the manufacture approach of the organic electroluminescent element of this invention forms the anode plate which pours in an electron hole at least, the luminous layer which has a luminescence field, and the cathode which pours in an electron, it is spreading or sticking and applying the force to homogeneity about transparence resin in the sheet-like microlens group in which the semi-sphere-like microlens was formed, and consists of a configuration which forms a microlens group.

[0045]
By this configuration, it can form at an easy process, and it is workable and the manufacture approach of an organic electroluminescent element also with high productivity can be offered.

[0046]
[Embodiment of the Invention]
The organic electroluminescent element of this invention according to claim 1 The anode plate which pours in an electron hole at least on a substrate, and the luminous layer which has a luminescence field, It is the organic electroluminescent element equipped with the cathode which pours in an electron. The light emitted from a luminous layer is taken out from a substrate and the optical ejection side which counters, and is taken as the configuration which is having the microlens group which consists of a microlens of the shape of an abbreviation semi-sphere from which at least two or more magnitude differs formed on an optical ejection side.
[0047]
The following operations are acquired by this configuration.
[0048]
(1) Since the microlens group of the shape of an abbreviation semi-sphere from which at least two or more magnitude differs is formed on the substrate and the optical ejection side which counters, increase the area of an optical ejection side / air interface, the probability of the total reflection in an interface falls, and the ejection effectiveness of light improves.
[0049]
(2) Since the microlens group of the shape of an abbreviation semi-sphere from which at least two or more magnitude differs is formed on the substrate and the optical ejection side which counters, the total reflection in an optical ejection side / air interface is controlled, and the ejection effectiveness of light improves.
[0050]
(3) Since the microlens group of the shape of an abbreviation semi-sphere from which at least two or more magnitude differs is formed on the substrate and the optical ejection side which counters and the luminous intensity distribution of light change with lens effectiveness, effectual brightness improves.
[0051]
(4) Since the direct microlens group is formed on the optical ejection side, distance of lens structure and a light-emitting part can be made small.
[0052]
(5) Since the direct microlens group is formed on the optical ejection side, the loss of the light by the substrate does not occur but the ejection effectiveness of light improves.
[0053]
(6) Since the direct microlens group is formed on the optical ejection side and transfer of the light to the longitudinal direction of a pixel side is controlled, the ejection effectiveness of light improves, without being accompanied by the fall of visibility, such as an optical blot.
[0054]
(7) Since the microlens group from which at least two or more magnitude differs is directly formed on the optical ejection side, there is no constraint to a pixel configuration or area, and efficient luminescence can be maintained over a long period of time.
[0055]
(8) Since the microlens group from which at least two or more magnitude differs is directly formed on the optical ejection side, a production process is easy and can produce easily.
[0056]
The anode plate where invention according to claim 2 pours in an electron hole at least on a substrate, It is the organic electroluminescent element equipped with the luminous layer which has a luminescence field, and the cathode which pours in an electron. The microlens group which consists of a microlens of the shape of an abbreviation semi-sphere from which the light emitted from a luminous layer is taken out from a substrate and the optical ejection side which counters, and at least two or more magnitude differs on an optical ejection side, It considers as the configuration which is having the microlens group which comes to form the flattening side where that front face becomes flat through an air space and some contacts at the optical ejection side side of that microlens group formed. By this configuration (1) Since the microlens group and the flattening side are formed on the substrate and the optical ejection side which counters, the area of a microlens group / air interface is increased, the probability of the total reflection in an interface falls, and the ejection effectiveness of light improves.
[0057]
(2) Since the microlens group and the flattening side are formed on the substrate and the optical ejection side which counters, the total reflection in a microlens group / air interface is controlled, and the ejection

effectiveness of light improves.
[0058]
(3) Since the direct microlens group is formed on the optical ejection side, distance of lens structure and a light-emitting part can be made small.
[0059]
(4) Since the flattening side where the front face becomes flat is formed in the optical ejection side side of a microlens group through an air space and some contacts, even if dust etc. adheres to the front face of an optical ejection side, the value of the ejection effectiveness of light does not fall.
[0060]
(5) Since a flattening side is formed in an optical ejection side side, even if dust etc. adheres to the front face of an optical ejection side, it can remove easily.
[0061]
(6) Since a flattening side is formed in an optical ejection side side and the microlens group does not touch the direct open air, the effectiveness of a lens can be held over a long period of time.
[0062]
(7) Since a flattening side is formed in an optical ejection side side, the sheet for preventing the visibility fall by outdoor daylight etc. can be easily formed in the front face of an optical ejection side.
[0063]
(8) Since a flattening side is formed in an optical ejection side side, even if the force is added from the exterior, it can control that the configuration of a microlens group changes.
[0064]
(9) Since it consists of a microlens group which forms a flattening side in an optical ejection side side, even if it thickens a flattening side, since the effect of the ejection effectiveness on light is small, it is easy to maintain the reinforcement of a microlens group.
[0065]
Invention according to claim 3 is an organic electroluminescent element according to claim 1 or 2, a microlens group considers as the configuration which it comes to stick on an optical ejection side through optical binding material, and, in addition to claim 1 or an operation of 2, the following operations are acquired by this configuration.
[0066]
(1) Since the microlens group is stuck through optical binding material on the optical ejection side, a light-emitting part and a microlens group are producible according to an individual, the effect of a factor which gives a damage to the luminous layer generated in case a microlens group is formed can be lost, and a microlens group and a light-emitting part can be produced easily.
[0067]
(2) Since the microlens group is stuck through optical binding material on the optical ejection side, a light-emitting part and a microlens group can be produced according to an individual, it is possible to form a microlens group as one sheet, and handling is easy.
[0068]
(3) Since a light-emitting part and a microlens group are producible according to an individual, it is possible to an optical ejection side side to form the microlens group which comes to form a flattening side as one sheet, and since both the front faces of a sheet are flat, handling is easy for it.
[0069]
(4) Since the microlens group is stuck through optical binding material on the optical ejection side, even if the shape of a microlens group and surface type of a light-emitting part is not in agreement, it can stick easily.
[0070]
(5) Since the microlens group which consists of a microlens group and a flattening side can be formed as one sheet, it can consider as the sheet for preventing the visibility fall by outdoor daylight, and the unified sheet, and can form easily.
[0071]
invention according to claim 4 -- claim 1 thru/or an organic electroluminescent element component given in the inside 1 [any] of 3 -- it is -- a microlens group -- a refractive index 1.4 -- high -- it considers as the configuration currently formed with the refractive index ingredient.
[0072]
In addition to claim 1 thru/or an operation of 3, the following operations are acquired by this configuration.

[0073]
(1) Since the refractive index of a microlens group is large, the light which cannot reach a microlens group by total reflection can be decreased, and the ejection effectiveness of light improves.
[0074]
(2) Since the refractive index of a microlens group is large, the light which reaches a microlens group increases, the lens effectiveness of a microlens group can be confirmed, and the ejection effectiveness of light improves.
[0075]
(3) Since the refractive index of a microlens group is large, the light emitted from a luminous layer can serve as orientation which stood in the direction of a normal of a luminescence side, can decrease the optical loss inside a component, and can maintain the efficient luminescence engine performance excellent in visibility.
[0076]
Invention according to claim 5 is claim 1 thru/or an organic electroluminescent element given in the inside 1 [any] of 4, and a microlens group is taken as the configuration currently formed with the transparent ingredient which can emit 50% or more of the light emitted from a luminous layer.
[0077]
In addition to claim 1 thru/or an operation of 4, the following operations are acquired by this configuration.
[0078]
(1) Since the optical loss inside a component can be decreased, the efficient luminescence engine performance excellent in visibility is maintainable.
[0079]
(2) The optical loss inside a component decreases, and since it is reflected by the reflector and the light which is not taken out by total reflection into air can reuse, the efficient luminescence engine performance excellent in visibility is maintainable.
[0080]
Invention according to claim 6 is claim 1 thru/or an organic electroluminescent element given in the inside 1 [any] of 5, and a microlens group considers at least two or more ingredients as the configuration currently formed by carrying out optical association.
[0081]
In addition to claim 1 thru/or an operation of 5, the following operations are acquired by this configuration.
[0082]
(1) Since it is possible to share a function like the member which processing tends to carry out, and the member which can hold reinforcement, the alternative of an ingredient increases.
[0083]
(2) It is possible to give a complicated function to a microlens group by using two or more ingredients.
[0084]
(3) It is possible to give the visibility of arbitration by choosing the ingredient to be used suitably.
[0085]
Invention according to claim 7 is claim 1 thru/or an organic electroluminescent element given in the inside 1 [any] of 6, and a microlens group is taken as the configuration currently formed on the protective coat formed in the organic electroluminescent element front face.
[0086]
In addition to claim 1 thru/or an operation of 6, the following operations are acquired by this configuration.
[0087]
(1) Since the luminous layer is protected by the protective coat, the alternative of the manufacture process for forming a microlens group increases, and a microlens group can be formed easily.
[0088]
(2) Since the luminous layer is protected by the protective coat, the alternative of the ingredient for forming a microlens group increases, and a microlens group can be formed easily.
[0089]
(3) Since the luminous layer is protected by the protective coat, the alternative of optical binding material which sticks a microlens group increases, and a microlens group can be stuck easily.
[0090]
(4) Since the luminous layer is protected by the protective coat, the alternative of the method of application of optical binding material which sticks a microlens group increases, and a microlens group can be stuck easily.

[0091]
invention according to claim 8 -- an organic electroluminescent element according to claim 7 -- it is -- a protective coat -- a refractive index 1.4 -- high -- it considers as the configuration currently formed with the refractive index ingredient.
[0092]
In addition to an operation of claim 7, the following operations are acquired by this configuration.
[0093]
(1) The light which cannot reach a microlens group by total reflection can be decreased, and the ejection effectiveness of light improves.
[0094]
(2) Since the light which reaches a microlens group increases, effectiveness of a microlens group can be confirmed and the ejection effectiveness of light improves.
[0095]
(3) Since the light emitted from a luminous layer serves as orientation which stood in the direction of a normal of a luminescence side, the optical loss inside a component can be decreased and the efficient luminescence engine performance excellent in visibility can be maintained.
[0096]
Invention according to claim 9 is an organic electroluminescent element according to claim 7 or 8, and a protective coat is considered as the configuration currently formed with the transparent ingredient which can emit 50% or more of the light emitted from a luminous layer.
[0097]
In addition to claim 7 or an operation of 8, the following operations are acquired by this configuration.
[0098]
(1) Since the optical loss inside a component can be decreased, the efficient luminescence engine performance excellent in visibility is maintainable.
[0099]
(2) The optical loss inside a component decreases, and since it is reflected by the reflector and the light which is not taken out by total reflection into air can reuse, the efficient luminescence engine performance excellent in visibility is maintainable.
[0100]
invention according to claim 10 -- claim 3 thru/or an organic electroluminescent element given in the inside 1 [any] of 9 -- it is -- optical binding material -- a refractive index 1.4 -- high -- it considers as the configuration currently formed with the refractive index ingredient.
[0101]
In addition to claim 3 thru/or an operation of 9, the following operations are acquired by this configuration.
[0102]
(1) The light which cannot reach a microlens group by total reflection can be decreased, and the ejection effectiveness of light improves.
[0103]
(2) Since the light which reaches a microlens group increases, effectiveness of a microlens group can be confirmed and the ejection effectiveness of light improves.
[0104]
(3) Since the light emitted from a luminous layer serves as orientation which stood in the direction of a normal of a luminescence side, the optical loss inside a component can be decreased and the efficient luminescence engine performance excellent in visibility can be maintained.
[0105]
Invention according to claim 11 is claim 3 thru/or an organic electroluminescent element given in the inside 1 [any] of 10, and optical binding material is considered as the configuration currently formed with the transparent ingredient which can emit 50% or more of the light emitted from a luminous layer.
[0106]
In addition to claim 3 thru/or an operation of 10, the following operations are acquired by this configuration.

[0107]
(1) Since the optical loss inside a component can be decreased, the efficient luminescence engine performance excellent in visibility is maintainable.
[0108]

(2) The optical loss inside a component decreases, and since it is reflected by the reflector and the light which is not taken out by total reflection into air can reuse, the efficient luminescence engine performance excellent in visibility is maintainable.
[0109]
Invention according to claim 12 is claim 3 thru/or an organic electroluminescent element given in the inside 1 [any] of 11, and optical binding material is considered as the configuration currently formed with the liquid or the gel ingredient.
[0110]
In addition to claim 3 thru/or an operation of 11, the following operations are acquired by this configuration.

[0111]
(1) Since moderate flexibility is in optical binding material at the time of attachment of a microlens group and a luminous layer, even if the configurations of the surface parts of a microlens group and a luminous layer differ, it can stick easily.
[0112]
(2) Since moderate flexibility is in optical binding material at the time of attachment of a microlens group and a luminous layer, optical binding material can be applied easily.
[0113]
(3) Since there is flexibility between a microlens group and a luminous layer, to stress, such as bending, it is strong and the efficient luminescence engine performance which was excellent in visibility over the long period of time can be maintained.
[0114]
(4) Since there is flexibility between a microlens group and a luminous layer, it is strong to stress, such as bending, and it is easy to form a component with flexibility.
[0115]
Invention according to claim 13 is claim 3 thru/or an organic electroluminescent element given in the inside 1 [any] of 12, and optical binding material is considered as the configuration currently formed with the ingredient hardened by heat or light.
[0116]
In addition to claim 3 thru/or an operation of 12, the following operations are acquired by this configuration.

[0117]
(1) By choosing suitably the heat or light of optical binding material required for hardening, a microlens group and a luminous layer can be stuck easily, without giving a damage to a luminous layer.
[0118]
(2) Since the physical relationship of a microlens group and a luminous layer is held, after hardening of optical binding material can maintain the efficient luminescence engine performance which was excellent in visibility over the long period of time.
[0119]
(3) By choosing the thickness and the ingredient of optical binding material suitably, to stress, such as bending, it is strong and the efficient luminescence engine performance which was excellent in visibility over the long period of time can be maintained.
[0120]
(4) By choosing suitably the thickness and the ingredient of the charge of optical binding material, it is strong to stress, such as bending, and it is easy to form a component with flexibility.
[0121]
The anode plate and cathode of claim 1 thru/or an organic electroluminescent element given in the inside 1 [any] of 13 are separated and constituted by the individual electrical-and-electric-equipment target in the shape of a stripe, and image formation equipment according to claim 14 is considered as the configuration which has the image display array which it becomes from two or more pixels.
[0122]
The following operations are acquired by this configuration.
[0123]
(1) Since the optical loss inside a component can be decreased, the efficient luminescence engine performance can be maintained over a long period of time, and good lighting in a simple matrix method can be performed.

[0124]
(2) Since it separates into the individual electrical-and-electric-equipment target in the shape of a stripe, an anode plate and cathode can take the large light-emitting part in a pixel.
[0125]
(3) since momentary high brightness is needed in the case of a simple matrix -- this -- efficient and large-area-izing of a light-emitting part are very important.
[0126]
In image formation equipment according to claim 15, the anode plate or cathode of claim 1 thru/or an organic electroluminescent element given in the inside 1 [any] of 13 is separated by the individual electrical-and-electric-equipment target for every pixel, and it is constituted, and the separated electrode is scanned through at least one or more switching elements, and is considered as the configuration which has an image display array.
[0127]
The following operations are acquired by this configuration.
[0128]
(1) Since the optical loss inside a component can be decreased, the efficient luminescence engine performance can be maintained over a long period of time, and good lighting in an active-matrix method can be performed.
[0129]
(2) Since an anode plate or cathode is separated and constituted by the individual electrical-and-electric-equipment target for every pixel, momentary high brightness may be unnecessary, and practically required brightness is sufficient as it, and it can maintain stable luminescence over a long period of time.
[0130]
(3) Since an anode plate or cathode is scanned through at least one or more switching elements, it can realize free image formation and can fully employ efficiently the high-speed response which is the description of an organic electroluminescent element.
[0131]
(4) In the case of an active matrix, a light-emitting part is formed on a concave convex with a switching element, wiring, etc. which have been arranged in a pixel in many cases. Therefore, even if it is on such a concave convex, the measure from which efficient luminescence is obtained is very advantageous.
[0132]
Invention according to claim 16 is image formation equipment according to claim 14 or 15, and the diameter of the microlens which forms a microlens group is considered as a configuration smaller than the long side of a pixel.
[0133]
In addition to claim 14 or an operation of 15, the following operations are acquired by this configuration.
[0134]
(1) By considering the diameter of the microlens which forms a microlens group as a configuration smaller than the long side of a pixel, at least one or more microlenses can be arranged in one pixel, the same improvement effectiveness in ejection effectiveness is acquired in every pixel, and a good image can be obtained.
[0135]
(2) Since distance from a light-emitting part to the summit part of a microlens can be made small, the efficient luminescence engine performance excellent in visibility is maintainable.
[0136]
Invention according to claim 17 is claim 14 thru/or image formation equipment given in the inside 1 [any] of 16, and the diameter of the microlens which forms a microlens group is considered as a configuration smaller than the shorter side of a pixel.
[0137]
In addition to claim 14 thru/or an operation of 16, the following operations are acquired by this configuration.
[0138]
(1) By considering the diameter of the microlens which forms a microlens group as a configuration smaller than the shorter side of a pixel, at least one or more microlenses can be densely arranged in a pixel, the same improvement effectiveness in ejection effectiveness is acquired in every pixel, and a good image can be obtained.

[0139]
(2) At least one or more microlenses can be densely arranged in a pixel, ejection of a uniform light which does not have directivity in every pixel is performed, and the good image excellent in visibility can be obtained.
[0140]
(3) Since distance from a light-emitting part to the summit part of a microlens can be made very small, the efficient luminescence engine performance excellent in visibility is maintainable.
[0141]
Invention according to claim 18 is image formation equipment of a publication, and considers distance from a luminous layer to the outermost surface of a microlens group as a configuration smaller than the long side of a pixel in claim 14 thru/or the inside 1 [any] of 17.
[0142]
In addition to claim 14 thru/or an operation of 17, the following operations are acquired by this configuration.
[0143]
(1) Since the distance from a light-emitting part to the outermost surface of a microlens group is smaller than the long side of a pixel, an optical blot serves as breadth of pixel long side extent, and can maintain the efficient luminescence engine performance excellent in visibility.
[0144]
(2) Since the distance from a light-emitting part to the outermost surface of a microlens group is smaller than the long side of a pixel, the breadth to the longitudinal direction of light serves as pixel long side extent, can perform reuse of light easily, and can maintain the efficient luminescence engine performance excellent in visibility.
[0145]
Invention according to claim 19 is image formation equipment of a publication, and considers distance from a luminous layer to the outermost surface of a microlens group as a configuration smaller than the shorter side of a pixel in claim 14 thru/or the inside 1 [any] of 18.
[0146]
In addition to claim 14 thru/or an operation of 18, the following operations are acquired by this configuration.
[0147]
(1) Since the distance from a light-emitting part to the outermost surface of a microlens group is smaller than the shorter side of a pixel, an optical blot serves as breadth of pixel shorter side extent, is highly minute and can maintain the efficient luminescence engine performance excellent in visibility.
[0148]
(2) Since the distance from a light-emitting part to the outermost surface of a microlens group is smaller than the shorter side of a pixel, the breadth to the longitudinal direction of light serves as pixel shorter side extent, and its reuse effectiveness of light is high and it can maintain the efficient luminescence engine performance excellent in visibility.
[0149]
A sound signal conversion means for a personal digital assistant according to claim 20 to be a personal digital assistant with which the display means consisted of a claim 14 thru/or image formation equipment given in the inside 1 [any] of 19, and to change voice into a sound signal, An actuation means to input the telephone number etc., and a display means to display an arrival-of-the-mail display, the telephone number, etc., It considers as the configuration equipped with the means of communications which changes a sound signal into a sending signal, a receiving means to change an input signal into a sound signal, the antenna which transmit and receive a sending signal and an input signal, and the control means which controls each part.
[0150]
The following operations are acquired by this configuration.
[0151]
(1) Since the optical loss inside a component can be decreased, the efficient luminescence engine performance can be maintained and lightweight-izing or the formation of a long time by streamlining of cell capacity etc. can be attained.
[0152]
(2) By designing a vision property (orientation of light) suitably, it can use according to an application as a

private window hard to see, a window where even two or more persons are legible from a perimeter.
[0153]
(3) By using a display means by which the flattening side on an optical ejection side was formed, since the microlens has not come out to a direct front face, even if contaminants, such as dust, adhere, the efficient image display excellent in visibility can be obtained.
[0154]
(4) Since an antifouling film etc. can be easily stuck on the flattening side on an optical ejection side, contaminants, such as dust, can be removed easily.
[0155]
[in the equipment which invention according to claim 21 was the manufacture approach of an organic electroluminescent element, and was made into the vacua after forming the anode plate which pours in an electron hole at least, the luminous layer which has a luminescence field, and the cathode which pours in an electron] An optical ejection side is turned to ******, heat curing or photo-curing transparence resin is sprayed in the shape of a fog from down, and it considers forming said microlens group by that thing [carrying out postcure] as the configuration which it had, and is this configuration,
(1) The organic electroluminescent element which can maintain the luminescence engine performance over a long period of time at an easy process can be created.
[0156]
(2) Since the formation approach is easy, it is workable and productivity is also high.
[0157]
(3) Since it can form by vacuum consistency, it is workable, productivity is also high and a stable organic electroluminescent element can be created further at a long period of time.
The operation to say is acquired.
[0158]
The anode plate which invention according to claim 22 is the manufacture approach of an organic electroluminescent element, and pours in an electron hole at least, By allotting and vibrating the spherical transparence bead of the amount of extent which covers all front faces to an optical ejection side, after forming the luminous layer which has a luminescence field, and the cathode which pours in an electron A transparence bead is arranged in the dense condition on an optical ejection side, viscous low transparence resin is slushed, and it considers forming said microlens group by that thing [carrying out postcure] as the configuration which it had, and is this configuration,
(1) The organic electroluminescent element which can maintain the luminescence engine performance over a long period of time at an easy process can be created.
[0159]
(2) Since the formation approach is easy, it is workable and productivity is also high.
[0160]
(3) A dense microlens group can be formed easily and an efficient organic electroluminescent element can be created.
The operation to say is acquired.
[0161]
The anode plate which invention according to claim 23 is the manufacture approach of an organic electroluminescent element, and pours in an electron hole at least, After forming the luminous layer which has a luminescence field, and the cathode which pours in an electron, viscous high transparence resin thinner than a transparence bead is applied to an optical ejection side. Or it sticks, the spherical transparence bead of the amount of extent which covers all front faces is arranged, the force is applied to homogeneity, and it considers forming said microlens group for an excessive bead by Lycium chinense as the configuration which it had, and is this configuration,
(1) The organic electroluminescence which can maintain the luminescence engine performance over a long period of time at an easy process can be created.
[0162]
(2) Since the formation approach is easy, it is workable and productivity is also high.
The operation to say is acquired.
[0163]
The anode plate which invention according to claim 24 is the manufacture approach of an organic electroluminescent element, and pours in an electron hole at least, After forming the luminous layer which has a luminescence field, and the cathode which pours in an electron, transparence resin is applied for the

sheet-like microlens group in which the semi-sphere-like microlens was formed. or -- the configuration equipped with forming said microlens group by sticking and applying the force to homogeneity -- carrying out -- this configuration -- (1) -- the organic electroluminescence which can maintain the luminescence engine performance over a long period of time at an easy process can be created.
[0164]
(2) Since the formation approach is easy, it is workable and productivity is also high.
The operation to say is acquired.
[0165]
Invention according to claim 25 is the organic electroluminescent element which equipped inter-electrode [two] with the luminous layer which has a luminescence field, it considers as the configuration which equipped one electrode side with the substrate and was equipped with the microlens group which consisted of abbreviation semi-sphere-like microlenses at the electrode side of another side, the probability of the total reflection in an interface falls, and its ejection effectiveness of light improves.
[0166]
Hereafter, the organic electroluminescent element in the gestalt of operation of this invention is explained to a detail. First, the configuration of the organic electroluminescent element in the gestalt of operation of this invention is explained.
[0167]
Drawing 1 is the outline sectional view of the organic electroluminescent element in the gestalt of operation of this invention. drawing 1 -- setting -- 1 -- for a luminous layer and 5, as for a microlens group and 6a, cathode and 6 are [a substrate and 2 / an anode plate and 4 / a flattening side and 7] optical binding material. In addition, the side which counters a substrate 1 is made into the optical ejection side in drawing 1 .
[0168]
And the microlens group 6 is formed in an optical ejection side (in this case, anode plate 2) as shown in drawing 1 (a). each microlens which constitutes this microlens group 6 -- abbreviation -- various gestalten including a semi-sphere and a half-ellipse ball can be taken that are hemispherical and what is necessary is just the structure which changes the include angle of light into arbitration, or takes out light in an interface with air. In addition, in this invention, it cannot be overemphasized that the spacial configuration which a semi-sphere is not limited to one half of spherical stereos, and cut the solid sphere or ellipse ball like 1/3 ball or 3/5 ball is included.
[0169]
Moreover, although the microlens which constitutes the microlens group 6 may be the same magnitude mutually, it becomes possible [arranging at random without a clearance to an optical ejection side by considering as mutually different magnitude], and can be contributed to improvement in optical ejection effectiveness in the location of the arbitration of an optical ejection side. Furthermore, the effectiveness of dispersion can also be given.
[0170]
In addition, when the microlens which constitutes the microlens group 6 is made into mutually different magnitude, in formation of the microlens group 6, the easy formation approach by spraying of polymeric materials etc. can be used, and strict management of dimensional accuracy etc. becomes unnecessary by the case where the microlens group 6 is especially formed to micron order, and since manufacture is also easy, it is desirable.
[0171]
Furthermore, the microlens group 6 may be formed in an optical ejection side (in this case, cathode 5) through the optical binding material 7, as shown in drawing 1 (b). In addition, the optical binding material 7 is a member which shines with the microlens group 6 and combines an ejection side optically.
[0172]
Moreover, as other gestalten of the microlens group 6, as shown in drawing 1 (c), you may be the configuration equipped with flattening side 6a from which the front face becomes flat through an air space and some contacts at the optical ejection side side of the microlens group 6. Flattening side 6a is constituted so that the microlens group 6 may not be exposed outside directly. This flattening side 6a can protect the microlens group 6, and since it is a flat side, it becomes still easier [processing to that front face].
[0173]
In addition, although you may be which configuration of a configuration of forming an anode plate 2 in the configuration which forms cathode 5 in a substrate 1 and forms an anode plate 2 through a luminous layer 4,

or a substrate 1, and forming cathode 5 through a luminous layer 4 as shown in drawing 1 (a) - (c), the anode plate 2 or cathode 5 formed in an optical ejection side side turns into a transparent electrode. Moreover, in order to raise the ejection effectiveness of light, as for the electrode formed in a substrate 1 side, forming with the ingredient which reflects light is desirable.
[0174]
Next, each configuration of the organic electroluminescent element in the gestalt of operation of this invention is explained in detail including an ingredient.
[0175]
First, a microlens group is explained. A microlens group consists of a microlens of the shape of an abbreviation semi-sphere from which at least two or more magnitude differs, and or it changes the include angle of light into arbitration in an interface with air, it should just be formed in an optical ejection side that what is necessary is just the structure which takes out light. As an ingredient of a microlens group, transparence or translucent soda lime glass, Barium strontium content glass, lead glass, aluminosilicate glass, Inorganic glass, such as inorganic oxide glass, such as borosilicate glass, barium borosilicate glass, and quartz glass, and inorganic fluoride glass, Or transparence or translucent polyethylene terephthalate, a polycarbonate, Pori polymethylmethacrylate, polyether sulfone, vinyl fluoride High polymer films, such as polypropylene, polyethylene, polyacrylate, amorphous polyolefine, and fluororesin etc., or cull KOGENO of transparence or As2S3 [translucent], As40S10, and S40germanium10 grade -- the id -- glass -- ZnO, Nb 2O5, Ta2O5, and SiO and Si3 -- it can choose from transparent materials, such as ingredients, such as a metallic oxide of N4, HfO2, and TiO2 grade, and a nitride, suitably, and can use. In addition, as an ingredient of a microlens group, it can choose from transparence or a translucent ingredient suitably, and can also use in the substrate ingredient mentioned later, and optical adhesives, such as a transparence resist ingredient, an ultraviolet curing mold, and a heat-curing mold, or the transparent material which compounded them can also be used further.
[0176]
Moreover, it is the member which optical binding material shines with a microlens group, and combines an ejection side optically, and the refractive index is equal to either a microlens group and an optical ejection side, or its large thing is desirable. The ingredient which has sufficient flexibility and a sufficient adhesive property among transparence or a translucent substrate ingredient among the substrate ingredients mentioned later as an ingredient of this optical binding material can be used.
[0177]
Moreover, a flattening side should just be the configuration that a microlens group is not exposed outside directly that what is necessary is just the flattening film with which the front face becomes flat through an air space and some contacts at the optical ejection side side of a microlens group. As an ingredient of this flattening film, any of transparence or a translucent substrate ingredient can be used among the substrate ingredients mentioned later, and since it is the member exposed outside directly, from an ingredient with sufficient reinforcement or flexibility, selectivity can be carried out suitably and it can use.
[0178]
Here, based on the lamination of the organic electroluminescent element shown in drawing 1 (a), when the refractive index of a microlens group was changed, optical simulation about the ejection effectiveness of the light of an about was performed.
[0179]
The result of this optical simulation is shown in drawing 2 . In addition, drawing 2 is a graph which shows the result of optical simulation.
[0180]
Here, the conditions of optical simulation are explained concretely. Setting [and] the refractive index of each class to ITO=2.0 and air =1.0 as luminous layer =1.7 and an anode plate, the thickness of each class is luminous layer =150nm, ITO=150nm, and diameter =50micrometer of a microlens group. Moreover, in this simulation, simulation was performed about the case where it is two, the case (air / microlens group / ITO / luminous layer / cathode / substrate) where it has (a) microlens group, and the case (air / ITO / luminous layer / cathode / substrate) where there is no (b) microlens group. In addition, in this simulation, the ejection effectiveness of the light at the time of changing the refractive index of the microlens county in (a) was searched for as a relative value to the ejection effectiveness of the light in (b). That is, in drawing 2 , an axis of abscissa shows a refractive index and the axis of ordinate shows (a) and ratio =(a)/(b) of the ejection effectiveness of light with (b).
[0181]

In addition, it shall be altogether reflected by the interface of a luminous layer and cathode, and the light from a luminous layer took into consideration only a luminous layer and the absorption in ITO. That is, the permeability of cathode of 100% of reflection factors, a luminous layer, ITO, and a microlens group is 80%, 97%, and 97%, respectively. Here, simulation was performed as refractive-index =1.3 of a microlens group, and 1.5, 1.7 and 1.9.

[0182]

In the above conditions, it takes out as the refractive index of a microlens group becomes large so that clearly from the result of this simulation which calculated the ratio of the ejection effectiveness when changing the refractive index of a microlens group shown in drawing 2 , and the relative value of effectiveness becomes large. If the value of a refractive index becomes 1.4 or more, the relative value of the ejection effectiveness of light will become large, and, specifically, will serve as max with point of inflection in the 1.7 neighborhoods. And although some fall is seen in a larger field than it, it will have about 1.8-time effectiveness even in this case. Thus, if the ejection effectiveness of light has the large refractive index of a microlens group, it will improve, and as for the refractive index of the microlens group, it is desirable that it is 1.4 or more. In addition, although it cannot be overemphasized that this includes the flattening side which constitutes a microlens group, it is the same also about the optical binding material formed in an optical ejection side, or the protective coat mentioned later, and it is [these configurations] desirable [a refractive index] that it is 1.4 or more.

[0183]

Next, a substrate is explained. As a substrate, in order not to use as an ejection side of light, transparence or opacity, and any substrate can be used and there should just be reinforcement which can hold an organic electroluminescent element. As an ingredient of a substrate, transparence or translucent soda lime glass, barium strontium content glass, Inorganic glass, such as inorganic oxide glass, such as lead glass, aluminosilicate glass, borosilicate glass, barium borosilicate glass, and quartz glass, and inorganic fluoride glass, Or transparence or translucent polyethylene terephthalate, a polycarbonate, Pori polymethylmethacrylate, polyether sulfone, vinyl fluoride High polymer films, such as polypropylene, polyethylene, polyacrylate, amorphous polyolefine, and fluororesin etc., or cull KOGENO of transparence or As2S3 [translucent], As40S10, and S40germanium10 grade -- the id -- glass -- Ingredients, such as a metallic oxide of ZnO, Nb 2O5, Ta2O5, SiO, Si3N4, HfO2, and TiO2 grade, and a nitride, Or semiconductor materials, such as opaque silicon, germanium, carbonization silicon, gallium arsenide, and gallium nitride, Or it can choose from said transparence substrate ingredient containing a pigment etc., the metallic material which performed insulating processing to the front face suitably, and can use, and the laminated circuit board which carried out the laminating of two or more substrate ingredients can also be used. In addition, the circuit which consists of resistance, a capacitor inductor diode transistor, etc. for driving an organic electroluminescent element may be formed in the interior of this substrate front face or a substrate.

[0184]

Moreover, an anode plate is an electrode which pours in an electron hole, and needs to inject an electron hole into a luminous layer or an electron hole transportation layer efficiently. A transparent electrode can be used as an anode plate. As an ingredient of a transparent electrode, metallic oxides, such as an indium stannic-acid ghost (ITO), tin oxide (SnO2), and a zinc oxide (ZnO), Or the transparence electric conduction film which consists of mixture, such as SnO:Sb (antimony) and ZnO:aluminum (aluminum), or metal thin films, such as a metal thin film called aluminum (aluminum), Cu (copper), Ti (titanium), and Ag (silver) of the thickness of extent which does not spoil transparency, a mixed thin film of these metals, and a laminating thin film, -- or conductive polymers, such as polypyrrole, etc. can be used. Moreover, it can also consider as a transparent electrode by carrying out the laminating of two or more above-mentioned transparent electrode ingredients, and forms by various kinds of polymerization methods, such as resistance heating vacuum evaporationo, electron beam evaporation, a spatter, or an electric-field polymerization method, etc. Moreover, in order to give sufficient conductivity, or in order to prevent ununiformity luminescence by the irregularity on the front face of a substrate, as for a transparent electrode, it is desirable to make it the thickness of 1nm or more. Moreover, in order to give sufficient transparency, it is desirable to make it the thickness of 500nm or less. Furthermore, as an anode plate, the big metal of work functions, such as Cr (chromium), nickel (nickel), Cu (copper), Sn (tin), W (tungsten), and Au(gold), or its alloy, an oxide, etc. can be used besides said transparent electrode, and the laminated structure by two or more ingredients which used these anode materials can also be used. However, when an anode plate is not formed in an optical ejection side side, in order to make the most of the effectiveness of a microlens group, as for an

anode plate, forming with the ingredient which reflects light is desirable. In addition, cathode should just be a transparent electrode in that case.

[0185]

Moreover, the amorphous carbon film may be prepared in an anode plate. In this case, it both has a function as a hole-injection electrode. That is, an electron hole is injected into a luminous layer or an electron hole transportation layer through the amorphous carbon film from an anode plate. Moreover, a spatter comes to form the amorphous carbon film between an anode plate, a luminous layer, or an electron hole transportation layer. Although there are isotropic graphite, anisotropy graphite, glassy carbon, etc. and it does not limit especially as a carbon target by sputtering, isotropic graphite with high purity is suitable. If the point that the amorphous carbon film is excellent is shown concretely, when the work function of the amorphous carbon film will be measured using Riken Keiki 1 [surface analysis equipment AC-], the work function of the amorphous carbon film is WC=5.40eV. Here, since the work function of ITO generally well used as an anode plate is WITO=5.05eV, it can pour in an electron hole having used the amorphous carbon film efficiently [direction] in a luminous layer or an electron hole transportation layer. Moreover, in case the amorphous carbon film is formed by the sputtering method, in order to control the electric resistance value of the amorphous carbon film, reactive sputtering is carried out under the mixed-gas ambient atmosphere of nitrogen or hydrogen, and an argon. Furthermore, in the thin film coating technology by the sputtering method etc., if thickness is set to 5nm or less, the film will serve as island-shape structure and the homogeneous film will not be obtained. Therefore, by 5nm or less, efficient luminescence is not obtained for the thickness of the amorphous carbon film, and effectiveness of the amorphous carbon film cannot be expected. When thickness of the amorphous carbon film is set to 200nm or more, a membranous color wears a blacking wash and luminescence of an organic electroluminescent element stops moreover, fully penetrating.

[0186]

Moreover, what has a fluorescence property in a visible region, and consists of a good fluorescent substance of membrane formation nature as a luminous layer is desirable. Besides Alq3 or Be-benzoquinolinol (BeBq2), it is 2 and 5-screw (5, 7-G t-pentyl-2-benzoxazolyl). - 1, 3, 4-thiadiazole, A 4 and 4'-bis(5, 7-Ben Chill-2-benzoxazolyl) stilbene, 4 and 4' bis[-] [5 and 7-G (2-methyl-2-butyl)-2-benzoxazolyl] stilbene, 2, a 5-bis(5, 7-G t-Ben Chill-2-benzoxazolyl) thio fin, 2, a 5-bis([5-alpha and alpha-dimethylbenzyl]-2-benzoxazolyl) thiophene, 2, 5-screw [5 and 7-G (2-methyl-2-butyl)-2-benzoxazolyl]-3, 4-diphenyl thiophene, 2, a 5-bis(5-methyl-2-benzoxazolyl) thiophene, A 4 and 4'-bis(2-benzoOKISAIZORIRU) biphenyl, 5-methyl-2-[2-[4-(5-methyl-2-benzoOKISAIZORIRU) phenyl] vinyl] benzoOKISAIZORIRU, Benzooxazole systems, such as 2-[2-(4-chlorophenyl) vinyl] [1 and 2-naphth d] oxazole, 2 2' -(p-phenylenedivinylene)- Benzothiazole systems, such as screw benzothiazole, 2-[2-[4-(2-benzoimidazolyl) phenyl] vinyl] benzimidazole, Fluorescent brighteners, such as benzimidazole systems, such as 2-[2-(4-carboxyphenyl) vinyl] benzimidazole, Bis(eight quinolinol) magnesium, bis(benzo-eight quinolinol) zinc, Bis(2-methyl-8-quinolate) aluminum oxide, a tris (eight quinolinol) indium, Tris (5-methyl-eight quinolinol) aluminum, an eight-quinolinol lithium, A tris (5-chloro-eight quinolinol) gallium, bis(5-chloro-eight quinolinol) calcium, Metal chelation oxy-NOIDO compounds, such as 8-hydroxyquinoline system metal complexes, such as Pori [zinc-bis(8-hydroxy-5-KINORI nonyl) methane], and dilithium EPINDORI dione, 1, 4-bis(2-methyl styryl) benzene, 1, 4-(3-methyl styryl) benzene, 1, 4-bis(4-methyl styryl) benzene, JISUCHIRIRU benzene, 1, 4-bis(2-ethyl styryl) benzene, 1, 4-bis(3-ethyl styryl) benzene, Styryl benzenoid compounds, such as 1 and 4-bis(2-methyl styryl) 2-methylbenzene, 2, 5-bis(4-methyl styryl) pyrazine, 2, 5-bis(4-ethyl styryl) pyrazine, 2 and 5-bis[2-(1-naphthyl) vinyl] pyrazine, 2, 5-bis(4-methoxy styryl) pyrazine, JISUCHIRU pyrazine derivatives, such as 2 and 5-bis[2-(4-biphenyl) vinyl] pyrazine, 2, and 5-bis[2-(1-pyrenyl) vinyl] pyrazine, The North America Free Trade Agreement RUIMIDO derivative, a perylene derivative, an OKISA diazole derivative, an aldazine derivative, a cyclopentadiene derivative, a styryl amine derivative, a coumarin system derivative, an aromatic series JIMECHIRI DIN derivative, etc. are used. Furthermore, an anthracene, salicylate, a pyrene, coronene, etc. are used. Or phosphorescence luminescent material, such as FAKU-tris (2-phenyl pyridine) iridium, may be used.

[0187]

Moreover, which structure of the two-layer structure of an electron hole transportation layer, a luminous layer or a luminous layer, and an electronic transportation layer and the three-tiered structure of an electron hole transportation layer, a luminous layer, and an electronic transportation layer is sufficient besides the monolayer structure of only a luminous layer. however -- the case of such a two-layer structure or a three-tiered structure -- an electron hole transportation layer and an anode plate -- or a laminating is carried out

and it is formed so that cathode may touch an electronic transportation layer.
[0188]
As an electron hole transportation layer, hole mobility is high, it is transparent and the good thing of membrane formation nature is desirable. Besides TPD, porphin, tetraphenylporphine copper, a phthalocyanine, Porphyrin compounds, such as a copper phthalocyanine and titanium phthalocyanine oxide, A 1 and 1-bis{4-(G P-tolylamino) phenyl} cyclohexane, 4, 4', a 4"-trimethyl triphenylamine, N and N, N', N'-tetrakis (P-tolyl)-P-phenylenediamine, 1-(N and N-G P-tolylamino) naphthalene, 4, a 4 'bis[- / -2-2] (dimethylamino)'-dimethyl triphenylmethane color, N, N, N', and N' -- the - tetra-phenyl -4 and 4' - diamino biphenyl -- N, N'-diphenyl-N, the N'-G m-tolyl -4, N, N-diphenyl-N, the N'-screw (3-methylphenyl) -1, 1' - 4 4'-diamine, Aromatic series tertiary amines, such as a 4'-diamino biphenyl and N-phenyl carbazole, Stilbene compounds, such as a 4-G P-tolylamino stilbene and 4-(G P-tolylamino)-4'-[4-(G P-tolylamino) styryl] stilbene, A triazole derivative, an OKISAJIZAZORU derivative, and an imidazole derivative, The poly aryl alkane derivative, a pyrazoline derivative, and a pyrazolone derivative, A phenylenediamine derivative, an annealing amine derivative, and an amino permutation chalcone derivative, an oxazole derivative, a styryl anthracene derivative, and full -- me -- non -- a derivative -- A hydrazone derivative, a silazane derivative, a polysilane system aniline system copolymer, giant-molecule oligomer, a styryl amine compound, an aromatic series JIMECHIRI DIN system compound, and organic materials, such as Pori 3-methylthiophene, are used. Moreover, the electron hole transportation layer of the macromolecule dispersed system which distributed the organic material for low-molecular electron hole transportation layers is also used into macromolecules, such as a polycarbonate.
[0189]
Moreover, as an electronic transportation layer, OKISA diazole derivatives, such as 1 and 3-bis(4-tert-buthylphenyl - 1, 3, 4-oxadiazolyl) phenylene (OXD-7), an anthra quinodimethan derivative, a diphenyl quinone derivative, etc. are used.
[0190]
Moreover, cathode is an electrode which pours in an electron, and needs to inject an electron into a luminous layer or an electronic transportation layer efficiently, and, generally the oxide of metals, such as aluminum (aluminum), In (indium), Mg (magnesium), Ti (titanium), Ag (silver), calcium (calcium), Sr (strontium), etc. with a small work function, or these metals, a fluoride and its alloy, a layered product, etc. are used. Moreover, when cathode is not formed in an optical ejection side side, in order to make the most of the effectiveness of a microlens group, as for cathode, forming with the ingredient which reflects light is desirable. When a microlens group is formed, it is difficult to control total reflection effectively to all light, therefore total reflection of the light which was not taken out into air among the light which reached the microlens group once is carried out by the interface with air, it is again spread inside a component, and reaches to cathode. Or in a luminous layer, since light is emitted isotropic, one half reaches to cathode among the light emitted by the luminous layer, before arriving at an optical ejection side. When formed with the ingredient with which cathode reflects light at this time, it is reflected, and again, the light which reached to this cathode can be spread in the direction of an optical drawing side, and may be used as an effective light. In order to confirm this effectiveness, as for cathode, forming with the ingredient which reflects light is desirable, and it is still more desirable that the reflection factor of light is 50% or more. Since the rate of the improvement in effectiveness by the microlens group is about 2 times, this can perform effective optical drawing, if the loss of light [in / in the reflection factor of light / 50% or more, i.e., cathode,] is 50% or less. Although it was required in the conventional organic electroluminescent element that the reflection factor of cathode should have been very high, when optical ejection effectiveness improves, selectivity, such as an ingredient of cathode, thickness, and the formation approach, is also expandable. In addition, the above thing is applied to an anode plate, when it forms in an optical ejection side side by using cathode as a transparent electrode.
[0191]
And cathode forms the high super-thin film of the light transmission nature which used the small metal of a work function for the interface which touches a luminous layer or an electronic transportation layer, is carrying out the laminating of the transparent electrode to the upper part, and can also use it as transparence cathode. Laminated structures, such as LiO2/aluminum, such as small Mg of especially a work function, a Mg-Ag alloy, an aluminum-Li alloy given in JP,5-121172,A and a Sr-Mg alloy or an aluminum-Sr alloy, and an aluminum-Ba alloy, or LiF/aluminum, are suitable as a cathode material.
[0192]
Furthermore, as the membrane formation approach of these cathode, resistance heating vacuum

evaporationo, electron beam evaporation, and a spatter are used.
[0193]
Thus, at least one side of an anode plate and cathode should just be a transparent electrode. Furthermore, although you may be both transparent electrodes, if one side is a transparent electrode in order to raise the ejection effectiveness of light, it is desirable that another side forms with the ingredient which reflects light.
[0194]
In addition, the transparency of extent which does not bar the transparence of the ingredient which constitutes the organic electroluminescent element in this invention, or a check by looking of luminescence according being translucent to an organic electroluminescent element is shown.
[0195]
Moreover, an organic electroluminescent element may be intercepted from the open air, in order to guarantee long duration stability, a protective coat may be formed if needed on the anode plate formed in an optical ejection side side, or cathode, and you may protect so that the layered product of an anode plate - cathode may be wrapped in on a substrate. That is, in order to suppress oxidation of an ingredient, and a reaction with moisture, it is desirable to prepare a protective coat over a long period of time because of dependability. The polymeric materials of a silane system with the resin of the glass membrane which consists of the thin film which consists of inorganic oxides, such as SiON, SiO, SiN and SiO2, aluminum2O3, and LiF, an inorganic nitride, and an inorganic fluoride or an inorganic oxide, an inorganic nitride, an inorganic fluoride, etc. as an ingredient of the protective coat or thermosetting, and a photoresist, or the closure effectiveness etc. are mentioned, and it is formed by the applying or method, such as vacuum evaporationo and sputtering. In addition, although a microlens group is formed on a protective coat when preparing a protective coat, it is formed through optical binding material if needed.
[0196]
Next, the application of the organic electroluminescent element of this invention is explained. The organic electroluminescent element of this invention can be used as image formation equipment which displays an image, and these image formation equipment can be used for the display of AV equipments, such as a display of the display of Personal Digital Assistants, such as a cellular phone, and PHS, PDA, television, a personal computer, car navigation, etc., a stereo, and radio, etc.
[0197]
Furthermore, it can use for the lighting system as the light source of a laser beam printer, a scanner, etc. Or it can also use as a lighting system as the mere light source like lighting fitting, such as a tonneau light and the right stand.
[0198]
It is desirable to use for the lighting system as the light source of the image formation equipment as a display which will display an image in various electronic equipment also in these if a predominance, like ease [the low power of an organic electroluminescent element and the formation of a lightweight thin shape] and a speed of response are quick is taken into consideration, a laser beam printer, a scanner, etc., etc.
[0199]
The gestalt of the 1 operation of this invention to the following is explained referring to a drawing.
[0200]
(Gestalt 1 of operation)
The organic electroluminescent element in the gestalt 1 of operation of this invention is described.
[0201]
Drawing 3 is the important section sectional view of the organic electroluminescent element in the gestalt 1 of operation.
[0202]
In drawing 3 , the luminous layer which the electron hole transportation layer by which the anode plates 2 and 3 where 1 was formed in the substrate and 2 was formed on the substrate 1 were formed on the substrate 2, and 4 are formed on the electron hole transportation layer 3, and has a luminescence field, the cathode where 5 was formed on the luminous layer 4, and 6 are the microlens groups formed on cathode 1.
[0203]
The organic electroluminescent element in the gestalt 1 of operation used a substrate 1 and cathode 5 of the side which counters as the transparent electrode, and equips cathode 5 front face with the microlens group 6 as a means of the improvement in ejection effectiveness of light. And by the microlens group 6, the include angle of the light emitted from a luminous layer is changed into the include angle of arbitration in the

interface of an optical ejection side and air, or is taken out into air.
[0204]
In addition, the component and the formation approach which were mentioned above can be used for the component and the formation approach of an organic electroluminescent element in the gestalt 1 of this operation. In addition, a well-known ingredient may be used conventionally.
[0205]
Furthermore, in the gestalt 1 of operation, although the case of the two-layer structure which consists of an electron hole transportation layer 3 and a luminous layer 4 was explained, especially about the structure, it is not limited to this as mentioned above. Namely, the two-layer structure of the monolayer structure of only a luminous layer 4, the electron hole transportation layer 3, a luminous layer 4 or a luminous layer 4, and an electronic transportation layer and the three-tiered structure of the electron hole transportation layer 3, a luminous layer 4, and an electronic transportation layer are sufficient, and what is necessary is just the structure of having at least the luminous layer 4 which has a luminescence field in inter-electrode [of an anode plate 2 and cathode 5 / two].
[0206]
Moreover, in the gestalt 1 of operation, although the case of the structure which forms an anode plate 2 in substrate 1 top face was explained, especially about the structure, it is not limited to this as mentioned above, and cathode 5 may be formed in substrate 1 top face.
[0207]
Moreover, about the gestalt of the closure, as an optical ejection side and a glass cap cannot stick, a glass cap can be formed by pasting up with UV hardening resin etc., or forming and closing a protective coat on the front face of an organic electroluminescent element etc. can adopt a means suitably. Otherwise, you may be the combination of a protective coat, shielding material, etc.
[0208]
As mentioned above, according to the gestalt 1 of operation, since light can be taken out efficiently, the efficient luminescence engine performance is maintainable.
[0209]
The organic electroluminescent element in the gestalt 1 of operation can be used as a lighting system or image formation equipment.
[0210]
(Gestalt 2 of operation)
The organic electroluminescent element in the gestalt 2 of operation of this invention is described.
[0211]
Drawing 4 is the important section sectional view of the organic electroluminescent element in the gestalt 2 of operation.
[0212]
For a substrate and 2, as for an electron hole transportation layer and 4, in drawing 4 , an anode plate and 3 are [1 / a luminous layer and 5] cathode. And 6 is a microlens group which consists of a microlens and flattening side 6a, and the protective coat by which 8 was formed on cathode 5, and 7 are optical binding material which sticks a protective coat 8 and the microlens group 6.
[0213]
The organic electroluminescent element in the gestalt 2 of operation Use a substrate 1 and cathode 5 of the side which counters as a transparent electrode, and the protective coat 8 for intercepting from moisture, a reactant gas, etc. under open air is formed in the top face. The microlens group 6 which consists of a microlens and flattening side 6a as a means of the improvement in ejection effectiveness of light is stuck on the front face of a protective coat 8 through the optical binding material 7. By the microlens group 6 The include angle of the light emitted from a luminous layer 4 is changed into the include angle of arbitration in the interface of an optical ejection side and air, or is taken out into air.
[0214]
In addition, also in the gestalt 2 of this operation, the component and the formation approach which were mentioned above, and what is conventionally well-known are sufficient as the component and the formation approach of an organic electroluminescent element.
[0215]
Furthermore, in the gestalt 2 of operation, although the case of the two-layer structure which consists of an electron hole transportation layer 3 and a luminous layer 4 was explained, especially about the structure, it is not limited to this as mentioned above.

[0216]
Moreover, in the gestalt 2 of operation, although the case of the structure which forms an anode plate 2 in substrate 1 top face was explained, especially about the structure, it is not limited to this as mentioned above, and cathode 5 may be formed in substrate 1 top face.
[0217]
Moreover, in the gestalt 2 of operation, although the protective coat 8 is formed and closed on the front face of an organic electroluminescent element about the gestalt of the closure, you may be structures, such as giving shielding nature to microlens group 6 the very thing otherwise.
[0218]
As mentioned above, according to the gestalt 2 of operation, since light can be taken out efficiently, the efficient luminescence engine performance is maintainable.
[0219]
The organic electroluminescent element in the gestalt 2 of operation can be used as a lighting system or image formation equipment.
[0220]
(Gestalt 3 of operation)
The image formation equipment using the organic electroluminescent element in the gestalt 3 of operation of this invention is described.
[0221]
Drawing 5 is the outline perspective view of the image formation equipment using the organic electroluminescent element in the gestalt 3 of operation. drawing 5 -- setting -- 1 -- for electron hole transportation and 4, as for cathode and 6, a luminous layer and 5 are [a substrate and 2 / an anode plate and 3 / a microlens group and 7] optical binding material.
[0222]
In the gestalt 3 of operation, as shown in drawing 3 , patterning of the anode plate 2 is carried out to the line, and patterning also of the cathode 5 is similarly carried out to this at the line in the form which carries out an abbreviation rectangular cross.
[0223]
If direct current voltage or a direct current is impressed to the anode plate 2 and cathode 5 which made the cathode 5 minus-side the anode plate 2 of this image formation equipment plus-side, and were connected and chosen as the drive circuit (driver) as a driving means which is not illustrated, the luminous layer 4 of the part which intersects perpendicularly emits light, and it can be used as image formation equipment of a simple matrix method.
[0224]
In the gestalt 3 of operation, the microlens group 6 formed in the component forming face of a substrate 1 in the shape of a sheet as an include-angle conversion means of light is stuck through the optical binding material 7. The microlens group 6 changes into the include angle of arbitration the include angle of the light emitted from a luminous layer 4 in an interface with air, or is taken out into air in an interface with air. Moreover, the microlens group 6 is a sheet used as a case, and the sheet-like microlens group which comes to join a microlens together.
[0225]
In addition, in the gestalt 3 of this operation, the component and the formation approach which it is not restricted to this and mentioned above, and what is conventionally well-known are sufficient as the component and the formation approach of an organic electroluminescent element.
[0226]
As mentioned above, in the image formation equipment of the gestalt 3 of operation, since light can be taken out efficiently, optical ejection effectiveness can improve and the efficient luminescence engine performance can be maintained. Moreover, since the distance from the luminous layer 4 to the microlens group 6 is smaller than the direction of a shorter side of a pixel, while being able to control optical propagation of the longitudinal direction in an optical ejection side and being able to maintain the efficient luminescence engine performance, there is no optical blot etc. and visibility becomes good.
[0227]
Moreover, in the gestalt 3 of operation, although the image formation equipment of a simple matrix method was explained, the image formation equipment of an active-matrix method may be used, and the same efficient luminescence engine performance as said simple matrix method can be maintained.
[0228]

In addition, the image formation equipment of the gestalt 3 of operation can be used also as lighting systems, such as the light source of a laser beam printer, a scanner, etc., only as image formation equipment which displays an image. Furthermore, without carrying out patterning to a line, an anode plate 2 and cathode 5 are made to emit light completely, and may be used as a mere lighting system.
[0229]
(Gestalt 4 of operation)
The personal digital assistant using the organic electroluminescent element of the gestalt 4 of operation of this invention is described.
[0230]
Drawing 6 is the perspective view showing the personal digital assistant which used the organic electroluminescent element of the gestalt 4 of operation, and drawing 7 is the block diagram showing the personal digital assistant which used the organic electroluminescent element of this invention.
[0231]
The microphone from which 10 changes voice into a sound signal in drawing 6 and drawing 7 , the loudspeaker from which 11 changes a sound signal into voice, The control unit by which 12 is constituted from a dial carbon button etc., and 13 are displays which display arrival of the mail etc., and consist of image formation equipment using the organic electroluminescent element of this invention. The sending signal which is the transmitting section which 14 changes the sound signal from a microphone 10 into an antenna, and changes 15 into a sending signal, and was created in the transmitting section 15 is emitted outside through an antenna 14. 16 is the receive section which changes into a sound signal the input signal which received with the antenna 14, and the sound signal created in the receive section 16 is changed into voice with a loudspeaker 11. 17 is a control section which controls the transmitting section 15, a receive section 16, a control unit 12, and a display 13.
[0232]
The voice at the time of a message of a user (addresser) etc. is inputted, from a loudspeaker 11, the voice and the notice sound of the other party are outputted and a microphone 10 is transmitted to a user (addressee). In addition, as a personal digital assistant, when using a pager, it is not necessary to form especially a microphone.
[0233]
Furthermore, the control unit 12 is equipped with the ten key and various kinds of function keys as a dial carbon button. Moreover, you may have the ten key, the not only various kinds of function keys but letter key, etc. From this control unit 12, predetermined data, such as a setup of the telephone number, a name, time of day, and various functions, E mail address, and URL, are inputted. Furthermore, not only the actuation by such keyboard but a pen input unit, an audio input unit, the MAG, or an optical input unit may be used for a control unit 12.
[0234]
Data or character icons, such as the telephone number memorized by predetermined data and the memory into which a display 13 is inputted from a control unit 12, E mail address, and URL, etc. are displayed.
[0235]
Moreover, an antenna 14 performs at least one side of transmission of an electric wave, or reception. In addition, with the gestalt of this operation, since transmission of a signal and reception were performed through radio, antennas (a helical antenna, flat antenna, etc.) were formed, but when performing optical communication etc., a light emitting device and a photo detector may be prepared instead of an antenna. In this case, a signal is transmitted to other communication equipment etc. by the light emitting device, and the signal from the outside is received by the photo detector.
[0236]
The transmitting section 15 and a receive section 16 change into a sound signal the input signal which changed the sound signal into the sending signal and received, respectively.
[0237]
Furthermore, the control section 17 is conventionally constituted by the well-known technique using CPU, memory, etc. which are not illustrated, and controls the transmitting section 15, a receive section 16 and a control unit 12, and a display 13. More specifically, an instruction is given to each control circuit, a drive circuit, etc. which were established in these each part and which are not illustrated. For example, the display-control circuit which received the display instruction from a control section 17 drives a display drive circuit, and a display is performed to a display 13.
[0238]

The actuation is explained below.
[0239]
First, when there is arrival of the mail, a terminating signal will be sent out to a control section 17 from a receive section 16, a control section 17 displays a predetermined character etc. on a display 13 based on the terminating signal, if the carbon button of a purport which receives arrival of the mail from a control unit 12 further is pushed, a signal will be sent out to a control section 17 and a control section 17 will set each part as arrival-of-the-mail mode. That is, while the signal received with the antenna 14 is changed into a sound signal in a receive section 16 and a sound signal is outputted as voice from a loudspeaker 11, the voice inputted from the microphone 10 is changed into a sound signal, and is sent out outside through an antenna 14 through the transmitting section 15.
[0240]
Next, the case where it sends is explained.
[0241]
First, when sending, the signal of a purport sent from a control unit 12 is inputted into a control section 17. Then, if the signal equivalent to the telephone number is sent to a control section 17 from a control unit 12, a control section 17 sends out the signal corresponding to the telephone number from an antenna 14 through the transmitting section 15. If the communication link with the other party is established and a signal to that effect will be sent to a control section 17 through a receive section 16 by the sending-out signal through an antenna 14, a control section 17 will set each part as dispatch mode. That is, while the signal received with the antenna 14 is changed into a sound signal in a receive section 16 and a sound signal is outputted as voice from a loudspeaker 11, the voice inputted from the microphone 10 is changed into a sound signal, and is sent out outside through an antenna 14 through the transmitting section 15.
[0242]
In addition, although the gestalt 4 of operation showed the example which carried out [voice] the transmit receive, effectiveness with the same said of the personal digital assistant which performs either [at least] transmission of data other than voice, such as not only voice but alphabetic data, or reception can be acquired.
[0243]
In the personal digital assistant by the gestalt 4 of such operation, since the efficient luminescence engine performance is maintainable, the amount of the power used, such as a dc-battery, can be controlled. It is possible for this to attain lightweight-ization according to the miniaturization of a dc-battery in to enable long duration use of a personal digital assistant ****. It is called for that the display device used especially for a personal digital assistant is high definition more, and it is a low power, and high definition and efficient-ization bring about a big merit in recent years compared with the optical ejection of the conventional organic electroluminescent element. By efficient-ization, streamlining of cell capacity is attained and lightweight-izing and long time-ization can be attained. Moreover, as a substrate of an organic electroluminescent element, if a high polymer film is used, it will become possible to bring about fast lightweight-ization.
[0244]
moreover, the personal digital assistant aiming at an object for individual treatment like a personal digital assistant -- setting -- a user -- only he can recognize information and the property that information cannot be recognized is demanded from the perimeter. Since it is possible to make orientation of light strong in the direction of a transverse plane in the display device in this invention, it is very effective to an application which was described above.
[0245]
[Example]
(Example 1)
The opaque substrate which consists of composite material of a polycarbonate and polyimide ultrasonic cleaning for [it is based on a detergent (fruity chemistry company make and SEMIKO -- clean)] 5 minutes -- Ultrasonic cleaning for [it is based on pure water] 10 minutes, ultrasonic cleaning for [it is based on the solution which mixed hydrogen peroxide solution 1 and water 5 to aqueous ammonia 1 (volume ratio)] 5 minutes, After carrying out washing processing at the order of ultrasonic cleaning for [it is based on 70-degree C pure water] 5 minutes, by the nitrogen blower, the moisture adhering to a substrate was removed, and it heated further and dried.
[0246]
Next, the cathode by which patterning was carried out with the metal mask by making the aluminum-Li

alloy containing 15at% Li into the source of vacuum evaporationo within the resistance heating vacuum evaporationo equipment which decompressed this substrate to the degree of vacuum of 2x10 to 6 or less Torrs was formed by 150nm thickness.

[0247]

Next, similarly, within resistance heating vacuum evaporationo equipment, Alq3 was formed by about 60nm thickness as a luminous layer on cathode, and TPD was formed by about 50nm thickness as an electron hole transportation layer on the luminous layer. In addition, both the evaporation rates of TPD and Alq3 were 0.2 nm/s.

[0248]

Next, within the low damage spatter equipment decompressed to the degree of vacuum of 2x10 to 6 or less Torrs, the mask was carried out with the metal mask and the ITO film of 160nm of thickness was formed on the electron hole transportation layer.

[0249]

Next, after having blown off the transparence resin of an ultraviolet curing mold from two or more nozzles in the shape of a fog, spraying the resin of the shape of a minute semi-sphere on the ITO film front face and taking this out from vacuum devices within the vacuum devices decompressed to the degree of vacuum of 5x10 to 3 or less Torrs, ultraviolet rays are irradiated, and were stiffened and the microlens configuration was formed in the ITO film front face.

[0250]

(Example 2)

after carrying out washing processing at the order of ultrasonic cleaning for [it twists the opaque substrate which consists of silicon in a detergent (fruity chemistry company make and SEMIKO -- clean)] 5 minutes, ultrasonic cleaning for [it is based on pure water] 10 minutes, ultrasonic cleaning for [it is based on the solution which mixed hydrogen peroxide solution 1 and water 5 to aqueous ammonia 1 (volume ratio)] 5 minutes, and ultrasonic cleaning for [it be based on 70-degree C pure water] 5 minutes, by the nitrogen blower, the moisture adhering to a substrate was removed and it dried.

[0251]

Next, the cathode by which patterning was carried out with the metal mask by making the aluminum-Li alloy containing 15at% Li into the source of vacuum evaporationo within the resistance heating vacuum evaporationo equipment which decompressed this substrate to the degree of vacuum of 2x10 to 6 or less Torrs was formed by 150nm thickness.

[0252]

Next, similarly, within resistance heating vacuum evaporationo equipment, Alq3 was formed by about 60nm thickness as a luminous layer on cathode, and TPD was formed by about 50nm thickness as an electron hole transportation layer on the luminous layer. In addition, both the evaporation rates of TPD and Alq3 were 0.2 nm/s.

[0253]

Next, within the low damage spatter equipment decompressed to the degree of vacuum of 2x10 to 6 or less Torrs, the mask was carried out with the metal mask and the ITO film of 160nm of thickness was formed on the electron hole transportation layer.

[0254]

Next, SiO2 3-micrometer film was formed on the ITO film within the sputtering system decompressed to the degree of vacuum of 2x10 to 6 or less Torrs.

[0255]

Next, the semi-sphere-like version was clamped on the PET front face at random, the reversal mold of microlens structure was formed, steel iron metal mold was formed by imprint according this to electrodeposition, and the microlens group which consists of a sheet-like polycarbonate was formed by hot working.

[0256]

Next, the adhesives for optics were uniformly applied to said protective coat front face, and the include-angle conversion panel of said light was stuck.

[0257]

(Example 3)

ultrasonic cleaning for [it twists the transparence substrate which consists of glass in a detergent (fruity chemistry company make and SEMIKO -- clean)] 5 minutes -- Ultrasonic cleaning for [it is based on pure water] 10 minutes, ultrasonic cleaning for [it is based on the solution which mixed hydrogen peroxide

solution 1 and water 5 to aqueous ammonia 1 (volume ratio)] 5 minutes, After carrying out washing processing at the order of ultrasonic cleaning for [it is based on 70-degree C pure water] 5 minutes, by the nitrogen blower, the moisture adhering to a substrate was removed, and it heated further and dried.
[0258]
Next, the cathode by which patterning was carried out with the metal mask by making the aluminum-Li alloy containing 15at% Li into the source of vacuum evaporationo within the resistance heating vacuum evaporationo equipment which decompressed this substrate to the degree of vacuum of 2x10 to 6 or less Torrs was formed by 150nm thickness.
[0259]
Next, similarly, within resistance heating vacuum evaporationo equipment, Alq3 was formed by about 60nm thickness as a luminous layer on cathode, and TPD was formed by about 50nm thickness as an electron hole transportation layer on the luminous layer. In addition, both the evaporation rates of TPD and Alq3 were 0.2 nm/s.
[0260]
Next, within the low damage spatter equipment decompressed to the degree of vacuum of 2x10 to 6 or less Torrs, the mask was carried out with the metal mask and the ITO film of 160nm of thickness was formed on the electron hole transportation layer.
[0261]
Next, the 3-micrometer silicon nitride film was formed on the ITO film within the sputtering system decompressed to the degree of vacuum of 2x10 to 6 or less Torrs.
[0262]
Next, the bead with a diameter of 20 micrometers which consists of an acrylic has been arranged densely, and the UV irradiation of the transparence resin of an ultraviolet curing mold was slushed and carried out. The bright film which consists of an acrylic as a flattening side was stuck on the front face of the microlens group of the shape of a semi-sphere formed by this by ultrasonic welding, and the sheet which consists of a microlens group in which the flattening side was formed was formed.
[0263]
Next, the adhesives for optics were uniformly applied to said protective coat front face, and said sheet was stuck.
[0264]
(Example 4)
The TFT array with which each pixel electrode which consists of Cr was connected to the signal line through TFT which consists of amorphous silicon on the transparence substrate which consists of glass was formed.
[0265]
Next, NEGAREJISUTO material was applied to this TFT array substrate front face with the spin coat method, the resist film with a thickness of 5 micrometers was formed in it, and the nonluminescent section without a pixel electrode was used as the mask and the TFT array substrate which was exposed, developed negatives and covered only the nonluminescent section with the resist film.
[0266]
next, after carrying out washing processing of this TFT array substrate at the order of ultrasonic cleaning for [it is based on a detergent (fruity chemistry company make and SEMIKO -- clean)] 5 minutes, and ultrasonic cleaning for [it is based on pure water] 10 minutes, by the nitrogen blower, the moisture adhering to a substrate was removed, and it heated further and dried.
[0267]
Next, the cathode by which patterning was carried out with the metal mask by making the aluminum-Li alloy containing 15at% Li into the source of vacuum evaporationo within the resistance heating vacuum evaporationo equipment which decompressed this TFT substrate to the degree of vacuum of 2x10 to 6 or less Torrs was formed by 150nm thickness.
[0268]
Next, similarly, within resistance heating vacuum evaporationo equipment, Alq3 was formed by about 60nm thickness as a luminous layer on cathode, and TPD was formed by about 50nm thickness as an electron hole transportation layer on the luminous layer. In addition, both the evaporation rates of TPD and Alq3 were 0.2 nm/s.
[0269]
Next, the ITO film of 160nm of thickness was formed on the electron hole transportation layer within the

low damage spatter equipment decompressed to the degree of vacuum of 2x10 to 6 or less Torrs.
[0270]
Next, the silicon nitride film of 3 micrometers of thickness was similarly formed as a protective coat on the organic toothing-like electroluminescent element within low damage spatter equipment.
[0271]
Next, the pressure sensitive adhesive sheet formed in the organic electroluminescent element front face protected by this protective coat with a thickness of 20 micrometers in the shape of a sheet was stuck.
[0272]
Next, the glass bead with which magnitude with a diameter of about 10 micrometers differs on the front face of this pressure sensitive adhesive sheet was arranged on the whole surface, and it pushed against homogeneity on the whole component front face. By repeating the same stroke 3 times, the bead has been uniformly arranged on the pressure sensitive adhesive sheet whole surface, and the microlens group was formed.
[0273]
(Example 1 of a comparison)
On the transparence substrate which consists of glass, like the example 1, after forming the ITO film of 160nm of thickness, on the ITO film, resist material (Tokyo adaptation shrine make, OFPR- 800) was applied with the spin coat method, the resist film with a thickness of 10 micrometers was formed, negatives were exposed and developed and patterning of the resist film was carried out to the mask and the configuration which is predetermined. Next, this substrate was immersed into 50% of hydrochloric acid at 60 degrees C, after etching the ITO film of a part with which the resist film is not formed, the resist film was also removed and the patterning substrate with which the anode plate which consists of ITO film of a predetermined pattern was formed was obtained.
[0274]
next, ultrasonic cleaning for [it twists this patterning substrate in a detergent (fruity chemistry company make and SEMIKO -- clean)] 5 minutes -- Ultrasonic cleaning for [it is based on pure water] 10 minutes, ultrasonic cleaning for [it is based on the solution which mixed hydrogen peroxide solution 1 and water 5 to aqueous ammonia 1 (volume ratio)] 5 minutes, After carrying out washing processing at the order of ultrasonic cleaning for [it is based on 70-degree C pure water] 5 minutes, by the nitrogen blower, the moisture adhering to a substrate was removed, and it heated further and dried.
[0275]
Next, TPD was formed in the front face by the side of the anode plate of a patterning substrate by about 50nm thickness as an electron hole transportation layer within the resistance heating vacuum evaporationo equipment decompressed to the degree of vacuum of 2x10 to 6 or less Torrs.
[0276]
Next, Alq3 was similarly formed by about 60nm thickness as a luminous layer on the electron hole transportation layer within resistance heating vacuum evaporationo equipment. In addition, both the evaporation rates of TPD and Alq3 were 0.2 nm/s.
[0277]
Next, cathode was similarly formed by 150nm thickness within resistance heating vacuum evaporationo equipment by making into the source of vacuum evaporationo the aluminum-Li alloy which contains 15at (s)% Li on a luminous layer.
[0278]
[Table 1]

	発光効率	発光面視認性	発光面視認性保護
実施例 1	◎	◎	△
実施例 2	○	○	△
実施例 3	○	○	○
実施例 4	◎	◎	△
比較例 1	△	△	○

[0279]
Here, the evaluation approach in the evaluation criteria of (Table 1) and its valuation basis are explained.
[0280]
The luminous efficiency of a component evaluated the luminescence brightness when passing a fixed current to an organic electroluminescent element. the valuation basis -- the luminescence brightness of the example 1 of a comparison -- receiving -- O: -- it excels very much -- O: excel -- it can do **:permission -- it comes out.
[0281]
The visibility of a luminescence side evaluated extent of visibility by viewing about the blot of light when using an organic electroluminescent element as the image formation equipment which consists of a 300-micrometer pixel, and dotage. evaluation -- three-step evaluation of O, O, and ** -- it is -- the valuation basis -- O: -- it excels very much -- O: excel -- it can do **:permission -- it comes out.
[0282]
Visibility protection of a luminescence side was evaluated about the ease of removing of the contaminant attached to the front face of an organic electroluminescent element. the valuation basis -- the ease of removing of the example 1 of a comparison -- receiving -- O: -- it excels very much -- O: excel -- it can do **:permission -- it comes out.
[0283]
Each organic electroluminescent element of examples 1, 2, 3, and 4 brought the result of having excelled altogether, in luminescence brightness and luminescence side visibility to the organic electroluminescent element of the example 1 of a comparison so that clearly from (Table 1). Especially, in examples 1 and 4, the result that luminescence brightness and luminescence side visibility excelled very much compared with the example 1 of a comparison was brought. However, although a result inferior to the organic electroluminescent element of the example 1 of a comparison was brought by each organic electroluminescent element of examples 1, 2, and 4 about luminescence side visibility protection, it is the effectiveness by this not having a flattening side, and there is especially no problem practically. It turns out to the example 1 of a comparison that the organic electroluminescent element of this example is an organic electroluminescent element which whose luminous efficiency was high and was excellent in visibility notably.
[0284]
[Effect of the Invention]
As mentioned above, according to the organic electroluminescent element of this invention, the following advantageous effectiveness is acquired.
[0285]
According to invention according to claim 1
(1) Since the microlens group of the shape of an abbreviation semi-sphere from which at least two or more magnitude differs is formed on the substrate and the optical ejection side which counters, increase the area of an optical ejection side / air interface, the probability of the total reflection in an interface falls, and the ejection effectiveness of light improves.
[0286]
(2) Since the microlens group of the shape of an abbreviation semi-sphere from which at least two or more magnitude differs is formed on the substrate and the optical ejection side which counters, the total reflection in an optical ejection side / air interface is controlled, and the ejection effectiveness of light improves.
[0287]
(3) Since the microlens group of the shape of an abbreviation semi-sphere from which at least two or more magnitude differs is formed on the substrate and the optical ejection side which counters and the luminous intensity distribution of light change with lens effectiveness, effectual brightness improves.
[0288]
(4) Since the direct microlens group is formed on the optical ejection side, distance of lens structure and a light-emitting part can be made small.
[0289]
(5) Since the direct microlens group is formed on the optical ejection side, the loss of the light by the substrate does not occur but the ejection effectiveness of light improves.
[0290]

(6) Since the direct microlens group is formed on the optical ejection side and transfer of the light to the longitudinal direction of a pixel side is controlled, the ejection effectiveness of light improves, without being accompanied by the fall of visibility, such as an optical blot.
[0291]
(7) Since the microlens group from which at least two or more magnitude differs is directly formed on the optical ejection side, there is no constraint to a pixel configuration or area, and efficient luminescence can be maintained over a long period of time.
[0292]
(8) Since the microlens group from which at least two or more magnitude differs is directly formed on the optical ejection side, a production process is easy and can produce easily.
[0293]
According to invention according to claim 2
(1) Since the microlens group and the flattening side are formed on the substrate and the optical ejection side which counters, increase the area of a microlens group / air interface, the probability of the total reflection in an interface falls, and the ejection effectiveness of light improves.
[0294]
(2) Since the microlens group and the flattening side are formed on the substrate and the optical ejection side which counters, the total reflection in a microlens group / air interface is controlled, and the ejection effectiveness of light improves.
[0295]
(3) Since the direct microlens group is formed on the optical ejection side, distance of lens structure and a light-emitting part can be made small.
[0296]
(4) Since the flattening side where the front face becomes flat is formed in the optical ejection side side of a microlens group through an air space and some contacts, even if dust etc. adheres to the front face of an optical ejection side, the value of the ejection effectiveness of light does not fall.
[0297]
(5) Since a flattening side is formed in an optical ejection side side, even if dust etc. adheres to the front face of an optical ejection side, it can remove easily.
[0298]
(6) Since a flattening side is formed in an optical ejection side side and the microlens group does not touch the direct open air, the effectiveness of a lens can be held over a long period of time.
[0299]
(7) Since a flattening side is formed in an optical ejection side side, the sheet for preventing the visibility fall by outdoor daylight etc. can be easily formed in the front face of an optical ejection side.
[0300]
(8) Since a flattening side is formed in an optical ejection side side, even if the force is added from the exterior, it can control that the configuration of a microlens group changes.
[0301]
(9) Since it consists of a microlens group which forms a flattening side in an optical ejection side side, even if it thickens a flattening side, since the effect of the ejection effectiveness on light is small, it is easy to maintain the reinforcement of a microlens group.
[0302]
According to invention according to claim 3, it adds to claim 1 or the effectiveness of 2,
(1) Since the microlens group is stuck through optical binding material on the optical ejection side, a light-emitting part and a microlens group are producible according to an individual, the effect of a factor which gives a damage to the luminous layer generated in case a microlens group is formed can be lost, and a microlens group and a light-emitting part can be produced easily.
[0303]
(2) Since the microlens group is stuck through optical binding material on the optical ejection side, a light-emitting part and a microlens group can be produced according to an individual, it is possible to form a microlens group as one sheet, and handling is easy.
[0304]
(3) Since a light-emitting part and a microlens group are producible according to an individual, it is possible to an optical ejection side side to form the microlens group which comes to form a flattening side as one sheet, and since both the front faces of a sheet are flat, handling is easy for it.

[0305]
(4) Since the microlens group is stuck through optical binding material on the optical ejection side, even if the shape of a microlens group and surface type of a light-emitting part is not in agreement, it can stick easily.
[0306]
(5) Since the microlens group which consists of a microlens group and a flattening side can be formed as one sheet, it can consider as the sheet for preventing the visibility fall by outdoor daylight, and the unified sheet, and can form easily.
[0307]
According to invention according to claim 4, it adds to any 1 effectiveness among claim 1 thru/or 3,
(1) Since the refractive index of a microlens group is large, the light which cannot reach a microlens group by total reflection can be decreased, and the ejection effectiveness of light improves.
[0308]
(2) Since the refractive index of a microlens group is large, the light which reaches a microlens group increases, the lens effectiveness of a microlens group can be confirmed, and the ejection effectiveness of light improves.
[0309]
(3) Since the refractive index of a microlens group is large, the light emitted from a luminous layer can serve as orientation which stood in the direction of a normal of a luminescence side, can decrease the optical loss inside a component, and can maintain the efficient luminescence engine performance excellent in visibility.
[0310]
According to invention according to claim 5, it adds to any 1 effectiveness among claim 1 thru/or 4,
(1) Since the optical loss inside a component can be decreased, the efficient luminescence engine performance excellent in visibility is maintainable.
[0311]
(2) The optical loss inside a component decreases, and since it is reflected by the reflector and the light which is not taken out by total reflection into air can reuse, the efficient luminescence engine performance excellent in visibility is maintainable.
[0312]
According to invention according to claim 6, it adds to any 1 effectiveness among claim 1 thru/or 5,
(1) Since it is possible to share a function like the member which processing tends to carry out, and the member which can hold reinforcement, the alternative of an ingredient increases.
[0313]
(2) It is possible to give a complicated function to a microlens group by using two or more ingredients.
[0314]
(3) It is possible to give the visibility of arbitration by choosing the ingredient to be used suitably.
[0315]
According to invention according to claim 7, it adds to any 1 effectiveness among claim 1 thru/or 6,
(1) Since the luminous layer is protected by the protective coat, the alternative of the manufacture process for forming a microlens group increases, and a microlens group can be formed easily.
[0316]
(2) Since the luminous layer is protected by the protective coat, the alternative of the ingredient for forming a microlens group increases, and a microlens group can be formed easily.
[0317]
(3) Since the luminous layer is protected by the protective coat, the alternative of optical binding material which sticks a microlens group increases, and a microlens group can be stuck easily.
[0318]
(4) Since the luminous layer is protected by the protective coat, the alternative of the method of application of optical binding material which sticks a microlens group increases, and a microlens group can be stuck easily.
[0319]
According to invention according to claim 8, it adds to the effectiveness of claim 7,
(1) The light which cannot reach a microlens group by total reflection can be decreased, and the ejection effectiveness of light improves.
[0320]
(2) Since the light which reaches a microlens group increases, effectiveness of a microlens group can be

confirmed and the ejection effectiveness of light improves.
[0321]
(3) Since the light emitted from a luminous layer serves as orientation which stood in the direction of a normal of a luminescence side, the optical loss inside a component can be decreased and the efficient luminescence engine performance excellent in visibility can be maintained.
[0322]
According to invention according to claim 9, it adds to claim 7 or the effectiveness of 8,
(1) Since the optical loss inside a component can be decreased, the efficient luminescence engine performance excellent in visibility is maintainable.
[0323]
(2) The optical loss inside a component decreases, and since it is reflected by the reflector and the light which is not taken out by total reflection into air can reuse, the efficient luminescence engine performance excellent in visibility is maintainable.
[0324]
According to invention according to claim 10, it adds to any 1 effectiveness among claim 3 thru/or 9,
(1) The light which cannot reach a microlens group by total reflection can be decreased, and the ejection effectiveness of light improves.
[0325]
(2) Since the light which reaches a microlens group increases, effectiveness of a microlens group can be confirmed and the ejection effectiveness of light improves.
[0326]
(3) Since the light emitted from a luminous layer serves as orientation which stood in the direction of a normal of a luminescence side, the optical loss inside a component can be decreased and the efficient luminescence engine performance excellent in visibility can be maintained.
[0327]
According to invention according to claim 11, it adds to any 1 effectiveness among claim 3 thru/or 10,
(1) Since the optical loss inside a component can be decreased, the efficient luminescence engine performance excellent in visibility is maintainable.
[0328]
(2) The optical loss inside a component decreases, and since it is reflected by the reflector and the light which is not taken out by total reflection into air can reuse, the efficient luminescence engine performance excellent in visibility is maintainable.
[0329]
According to invention according to claim 12, it adds to any 1 effectiveness among claim 3 thru/or 11,
(1) Since moderate flexibility is in optical binding material at the time of attachment of a microlens group and a luminous layer, even if the configurations of the surface parts of a microlens group and a luminous layer differ, it can stick easily.
[0330]
(2) Since moderate flexibility is in optical binding material at the time of attachment of a microlens group and a luminous layer, optical binding material can be applied easily.
[0331]
(3) Since there is flexibility between a microlens group and a luminous layer, to stress, such as bending, it is strong and the efficient luminescence engine performance which was excellent in visibility over the long period of time can be maintained.
[0332]
(4) Since there is flexibility between a microlens group and a luminous layer, it is strong to stress, such as bending, and it is easy to form a component with flexibility.
[0333]
According to invention according to claim 13, it adds to any 1 effectiveness among claim 3 thru/or 12,
(1) By choosing suitably the heat or light of optical binding material required for hardening, a microlens group and a luminous layer can be stuck easily, without giving a damage to a luminous layer.
[0334]
(2) Since the physical relationship of a microlens group and a luminous layer is held, after hardening of optical binding material can maintain the efficient luminescence engine performance which was excellent in visibility over the long period of time.
[0335]

(3) By choosing the thickness and the ingredient of optical binding material suitably, to stress, such as bending, it is strong and the efficient luminescence engine performance which was excellent in visibility over the long period of time can be maintained.
[0336]
(4) By choosing suitably the thickness and the ingredient of the charge of optical binding material, it is strong to stress, such as bending, and it is easy to form a component with flexibility.
[0337]
According to invention according to claim 14, it adds to any 1 effectiveness among claim 1 thru/or 13,
(1) Since the optical loss inside a component can be decreased, the efficient luminescence engine performance can be maintained over a long period of time, and good lighting in a simple matrix method can be performed.
[0338]
(2) Since it separates into the individual electrical-and-electric-equipment target in the shape of a stripe, an anode plate and cathode can take the large light-emitting part in a pixel.
[0339]
(3) since momentary high brightness is needed in the case of a simple matrix -- this -- efficient and large-area-izing of a light-emitting part are very important.
[0340]
According to invention according to claim 15, in addition to any 1 effectiveness, the following operations are acquired by this configuration among claim 1 thru/or 13.
[0341]
(1) Since the optical loss inside a component can be decreased, the efficient luminescence engine performance can be maintained over a long period of time, and good lighting in an active-matrix method can be performed.
[0342]
(2) Since an anode plate or cathode is separated and constituted by the individual electrical-and-electric-equipment target for every pixel, momentary high brightness may be unnecessary, and practically required brightness is sufficient as it, and it can maintain stable luminescence over a long period of time.
[0343]
(3) Since an anode plate or cathode is scanned through at least one or more switching elements, it can realize free image formation and can fully employ efficiently the high-speed response which is the description of an organic electroluminescent element.
[0344]
(4) In the case of an active matrix, a light-emitting part is formed on a concave convex with a switching element, wiring, etc. which have been arranged in a pixel in many cases. Therefore, even if it is on such a concave convex, the measure from which efficient luminescence is obtained is very advantageous.
[0345]
According to invention according to claim 16, it adds to claim 14 or the effectiveness of 15,
(1) By considering the diameter of the microlens which forms a microlens group as a configuration smaller than the long side of a pixel, at least one or more microlenses can be arranged in one pixel, the same improvement effectiveness in ejection effectiveness is acquired in every pixel, and a good image can be obtained.
[0346]
(2) Since distance from a light-emitting part to the summit part of a microlens can be made small, the efficient luminescence engine performance excellent in visibility is maintainable.
[0347]
According to invention according to claim 17, it adds to any 1 effectiveness among claim 14 thru/or 16,
(1) By considering the diameter of the microlens which forms a microlens group as a configuration smaller than the shorter side of a pixel, at least one or more microlenses can be densely arranged in a pixel, the same improvement effectiveness in ejection effectiveness is acquired in every pixel, and a good image can be obtained.
[0348]
(2) At least one or more microlenses can be densely arranged in a pixel, ejection of a uniform light which does not have directivity in every pixel is performed, and the good image excellent in visibility can be obtained.
[0349]

(3) Since distance from a light-emitting part to the summit part of a microlens can be made very small, the efficient luminescence engine performance excellent in visibility is maintainable.
[0350]
According to invention according to claim 18, it adds to any 1 effectiveness among claim 14 thru/or 17,
(1) Since the distance from a light-emitting part to the outermost surface of a microlens group is smaller than the long side of a pixel, an optical blot serves as breadth of pixel long side extent, and can maintain the efficient luminescence engine performance excellent in visibility.
[0351]
(2) Since the distance from a light-emitting part to the outermost surface of a microlens group is smaller than the long side of a pixel, the breadth to the longitudinal direction of light serves as pixel long side extent, can perform reuse of light easily, and can maintain the efficient luminescence engine performance excellent in visibility.
[0352]
According to invention according to claim 19, it adds to any 1 effectiveness among claim 14 thru/or 18,
(1) Since the distance from a light-emitting part to the outermost surface of a microlens group is smaller than the shorter side of a pixel, an optical blot serves as breadth of pixel shorter side extent, is highly minute and can maintain the efficient luminescence engine performance excellent in visibility.
[0353]
(2) Since the distance from a light-emitting part to the outermost surface of a microlens group is smaller than the shorter side of a pixel, the breadth to the longitudinal direction of light serves as pixel shorter side extent, and its reuse effectiveness of light is high and it can maintain the efficient luminescence engine performance excellent in visibility.
[0354]
According to invention according to claim 20, it adds to any 1 effectiveness among claim 14 thru/or 19,
(1) Since the optical loss inside a component can be decreased, the efficient luminescence engine performance can be maintained and lightweight-izing or the formation of a long time by streamlining of cell capacity etc. can be attained.
[0355]
(2) By designing a vision property (orientation of light) suitably, it can use according to an application as a private window hard to see, a window where even two or more persons are legible from a perimeter.
[0356]
(3) By using a display means by which the flattening side on an optical ejection side was formed, since the microlens has not come out to a direct front face, even if contaminants, such as dust, adhere, the efficient image display excellent in visibility can be obtained.
[0357]
(4) Since an antifouling film etc. can be easily stuck on the flattening side on an optical ejection side, contaminants, such as dust, can be removed easily.
[0358]
According to invention according to claim 21
(1) The organic electroluminescent element which can maintain the luminescence engine performance over a long period of time at an easy process can be created.
[0359]
(2) Since the formation approach is easy, it is workable and productivity is also high.
[0360]
(3) Since it can form by vacuum consistency, it is workable, productivity is also high and a stable organic electroluminescent element can be created further at a long period of time.
[0361]
According to invention according to claim 22
(1) The organic electroluminescent element which can maintain the luminescence engine performance over a long period of time at an easy process can be created.
[0362]
(2) Since the formation approach is easy, it is workable and productivity is also high.
[0363]
(3) A dense microlens group can be formed easily and an efficient organic electroluminescent element can be created.
[0364]

According to invention according to claim 23
(1) The organic electroluminescence which can maintain the luminescence engine performance over a long period of time at an easy process can be created.
[0365]
(2) Since the formation approach is easy, it is workable and productivity is also high.
The operation to say is acquired.
[0366]
According to invention according to claim 24
(1) The organic electroluminescence which can maintain the luminescence engine performance over a long period of time at an easy process can be created.
[0367]
(2) Since the formation approach is easy, it is workable and productivity is also high.
[0368]
According to invention according to claim 25, the area of an optical ejection side / air interface is increased, the probability of the total reflection in an interface falls, and the ejection effectiveness of light improves.
[0369]
And offer of the image formation equipment which can maintain the efficient luminescence engine performance which was excellent in offer of the organic electroluminescent element which can maintain the efficient luminescence engine performance excellent in visibility, and visibility, and weight are light, and it can form at the long personal digital assistant of a time, and an easy process, and it is workable and the manufacture approach of an organic electroluminescent element also with high productivity can be offered.
[Brief Description of the Drawings]
[Drawing 1] The outline sectional view of the organic electroluminescent element in the gestalt of operation of this invention
[Drawing 2] The graph which shows the result of optical simulation
[Drawing 3] The important section sectional view of the organic electroluminescent element in the gestalt 1 of operation
[Drawing 4] The important section sectional view of the organic electroluminescent element in the gestalt 2 of operation
[Drawing 5] The outline perspective view of the image formation equipment using the organic electroluminescent element in the gestalt 3 of operation
[Drawing 6] The perspective view showing the personal digital assistant using the organic electroluminescent element of the gestalt 4 of operation
[Drawing 7] The block diagram showing the personal digital assistant using the organic electroluminescent element of this invention
[Drawing 8] The important section sectional view of the conventional organic electroluminescent element
[Drawing 9] The mimetic diagram showing the typical beam-of-light path in the important section cross section of the conventional organic electroluminescence element
[Description of Notations]
1 Substrate
2 Anode Plate
3 Electron Hole Transportation Layer
4 Luminous Layer
5 Cathode
6 Microlens Group
7 Optical Binding Material
8 Protective Coat
9 Light Source of Light Emitted from Luminous Layer
10 Microphone
11 Loudspeaker
12 Control Unit
13 Display
14 Antenna
15 Transmitting Section
16 Receive Section
17 Control Section

[Translation done.]

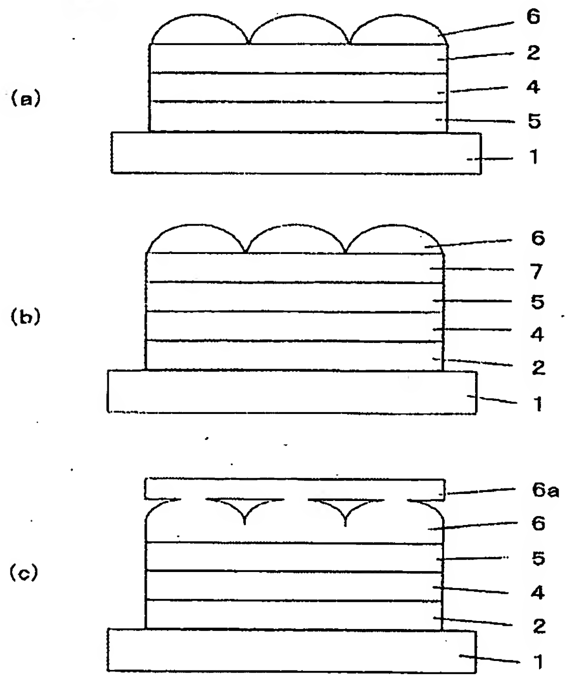
* NOTICES *

JPO and NCIPI are not responsible for any damages caused by the use of this translation.

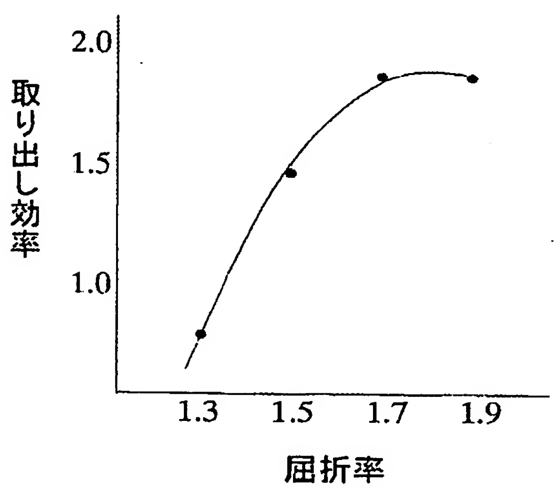
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

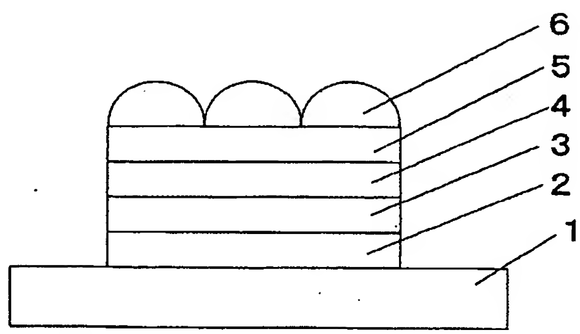
[Drawing 1]



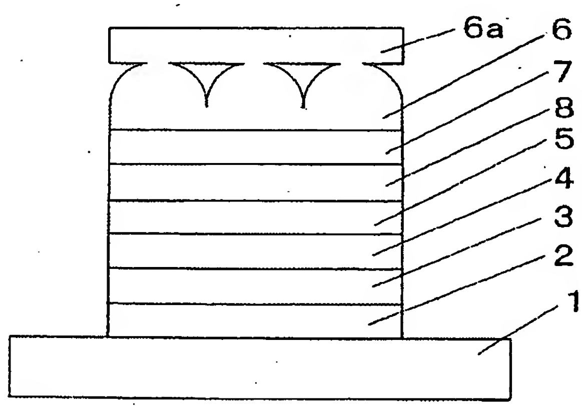
[Drawing 2]



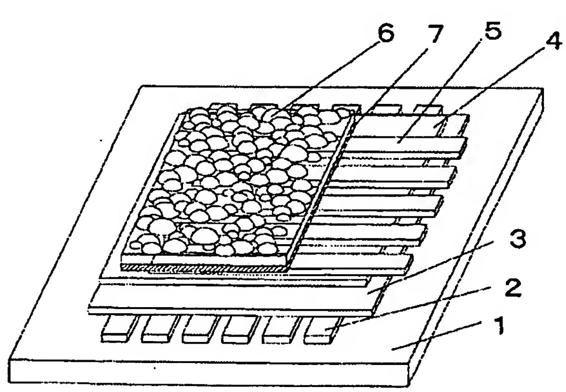
[Drawing 3]



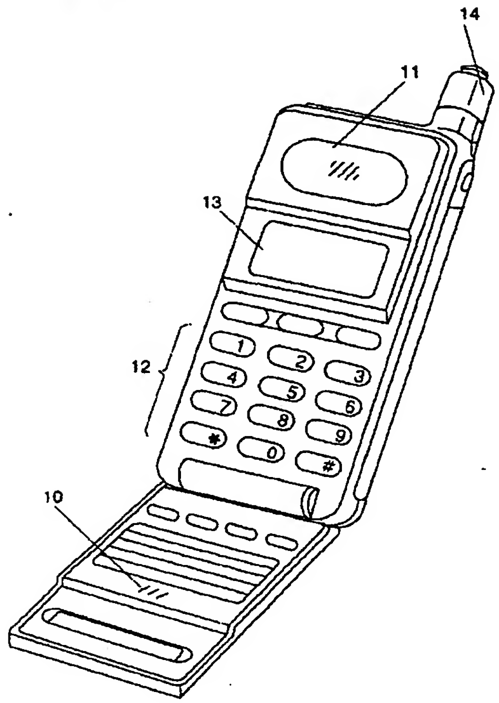
[Drawing 4]



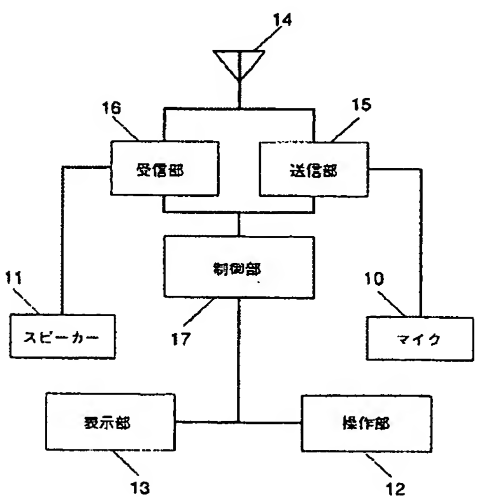
[Drawing 5]



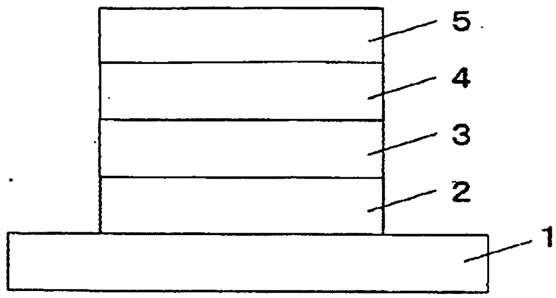
[Drawing 6]



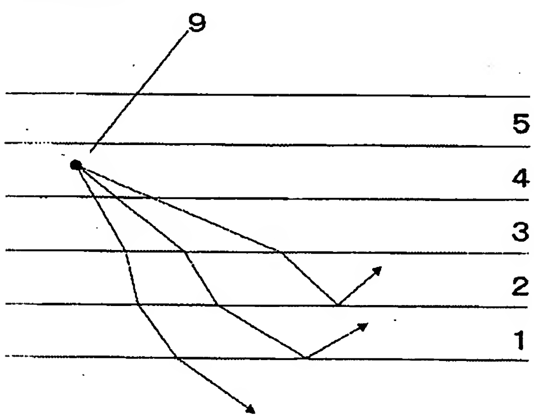
[Drawing 7]



[Drawing 8]



[Drawing 9]



[Translation done.]